The Ultimate Guide to LED Strips

Numbers and LEDs: What Does 2835, 3528, and 5050 Mean?

While purchasing LED strips, you will find numbers like 2835, 3528, and 5050 in the specification, which may need clarification. These numbers indicate the size of the LED. But what do these numbers mean, and why are they important?

LED numbers are the four-digit numbers indicating the size of the LED. Different LED sizes are available in the market, of which 2835, 3528, and 5050 are the most common. 2835 means the chip with this numbering has a 2.8mm * 3.5mm dimension. And likewise, 3528 and 5050 indicate the chip dimension of 3.5mm * 2.8 mm and 5.0mm * 5.0mm, respectively. Besides just the sizes, these numbers also represent the different properties of the LEDs.

This article will cover LED numbers, their meaning, properties, and how they differ. So let’s explore-

What Are LED Numbers?

LED numbers indicate the size of the LED in millimeters. It is a four-digit number, of which the first two digits represent the width of the LED. And the last two digits tell you its length. These numbers are usually expressed with the initial ‘SMD,’ which means ‘Surface Mounted Device.’

For example- SMD2835 implies the width of the LED is 2.8 millimeters, and its length is 3.5 millimeters. So, the larger the number, the more prominent the LED size. LEDs can be of different sizes, among which 2835, 3528, and 5050 are the most common.

Why Are LED Numbers Important?

The lighting effect of a LED fixture, like LED strips, depends much on the size of the chips. A bigger chip provides more prominent illumination than a smaller chip. So, LED numbers are essential, as they indicate LED chip sizes.

With the LED numbers in the specifications, you can quickly determine the lighting effect of the fixture. For example- an SMD5050 LED strip has bigger LEDs than SMD2835. So, the illumination of SMD5050 is brighter than SMD2835. Thus, these numbers tell you about the LED' s brightness. Again LED numbers let you know the number of LEDs that can fit per foot of PCB. And a larger LED size means only a few chips can fit in the PCB.

These numbers further indicate the LED' s power, intensity, beam angle, and efficiency. However, these values may vary with the LED density and brands. Different brands have standardized values for specific SMD numbers. For example- a 5050SMD 120LEDs single color LED strip of LEDYi has a power of 28.8 W and a beam angle of 120 degrees. Thus, LED numbers are essential to know the chip size, brightness, and power consumption. To sum up, these numbers give you an overall idea of the lighting.

What is SMD in LED?

To understand the term 'SMD' better, first, let us know about the construction of the LED strips. In a LED strip, the LEDs are mounted into a thin printed circuit board, PCB, without wirings. As these LED chips are directly mounted on the board' s surface, these chips are called surface-mounted devices or SMD. That is why the term SMD is often used as synonymous with LEDs. But this is incorrect, as there are non-SMD LEDs also like- COB and MCOB.

The term SMD is used in the LEDs along with four-digit numbers to indicate the size of the LED chips. Thus, SMD 2835, SMD3528, and SMD5050 show different LED sizes. However, all these numbers have specific features that you will know in the below portion of the article.

What is SMD2835?

SMD2835 means the width of the LED is 2.8 mm, and its length is 3.5mm. These LEDs have an identical appearance to the SMD 3285 chips. The latest technology in 2835 makes it significantly more reliable and steady. These LEDs are more energy efficient and brighter in comparison to SMD 3285. For LED strips, SMD 2835 is a trendy size. Additionally, it includes high-output LEDs with a long life.

What is SMD3528?

Surface Mounted Devices, like the SMD 3528, are considerably smaller. It is 3.5mm wide and 2.8mm in length. These LEDs include one diode in each LED. Due to the smaller size of these chips, you can add more of these chips per foot of the PCB. These chips are usually used in LED strips of 60 LEDs/meter. However, LEDYi SM3528 LED strips are available in 60LEDs, 120LEDs, 180LEDs, and 240LEDs per meter. Besides, we have customization options also!

What is SMD5050?

When discussing the SMD5050, they are as popular as the SMD 3528. SMD 5050 is 5.0mm x 5.0mm in size. This refers to a tri-chip, a three-diode in one LED. And so an SMD5050 LED produces three times more light than a one-diode SMD3528 chip. And because of this, it is essentially used as “task lighting.” These types of lighting are employed in areas where you are working—a kitchen and a study room.

These chips are suitable for RGB lighting. With the three-in-one chip of SMD5050, you can make millions of hues in RGB lighting. Besides, SMD 5050 is ideal for general lighting, such as replacing bright fluorescent lighting in homes, bars, restaurants, hotels, and other institutions.

What Is The Difference Between 2835, 3528, And 5050 LED Strips?

Besides the chip sizes, the LED numbers 2835, 3528, and 5050 have many other differences. Check the table below to know them-

Factors	SMD2835	SMD3528	SMD5050
LED Size	2.8mm * 3.5mm	3.5mm * 2.8mm	5.0mm * 5.0mm
Type of Chip	single-chip	single-chip	tri-chip
Brightness	High	Medium	Highest
Light emitting surface	Rectangular	Circular	Circular
Heat dispersion rate	Less	More	More
Price	Medium	Cheap	Pricey

So, comparing all these three LED numbers, we can find SMD2835 is the smallest chip. It has better heat dispersion than the other two. Again, for brightness, SMD5050 is the best option. However, for an affordable range, SMD3528 stands out.

SMD2835 Vs. SMD3528- Which One Is Better?

SMD2835 and SMD3528 are quite popular sizes of LED chips. To find out the better one of these two, first, let us know the differences between them-

Criteria	SMD2835	SMD3528
LED Size	2.8mm * 3.5mm	3.5mm * 2.8mm
Technology	Latest	Old
Brightness	Higher	Lower
Light emitting surface	Rectangular with round edges	Circular

Heat dispersion	Better	Regular
Price	Expensive than SMD3528	Affordable

From the above chart, you have already guessed SMD2835 is a better version of SMD3528. Let me explain the reasons-

- SMD2835 has the latest technology, whereas SMD3528 is a first-generation LED chip. The advanced technology available in SMD2835 solves the point light source phenomenon in 3528 lighting applications.
- The light-emitting surface of SMD2835 is rectangular with round corners. On the other hand, SMD3528 has a circular light-emitting surface. Comparing their surface area, SMD2835 has 2.1 times more light-emitting areas than SMD3528. Thus, it produces more uniform and bright lighting.
- SMD2835 excels for its lower heat dispersion. Due to its thin dimension and more extensive cooling area, it produces much less heat than SMD3528.
- SMD2835 has more efficiency. It produces equivalent brightness using less energy in comparison to SMD3528.

So, considering all these factors, SMD2835 is better than SMD3528.

SMD3528 Vs. SMD5050- Which One Is Better?

SMD3528 and SMD5050 both have circular light-emitting surfaces. Except for the sizes, they look almost the same in physical appearance. But there are differences in their lighting capability. Let’s check their differences before deciding which one is best.

Criteria	SMD3528	SMD5050
LED Size	3.5mm * 2.8mm	5.0mm * 5.0mm

Chip Type	Single-chip	Tri-chip
Brightness	Lower	Higher
Color option	Single color	Versatile color
RGB Application	No	Yes
No. of chip/foot	More than SMD5050	Limited due to large chip size
Price	Cost-effective	Expensive

This chart may confuse you to get the better one as both SMDs have some plus points. No worries, check the size-wise comparison between SM5050 and SMD3528 to choose the ideal one for you-

- The size of SMD3528 is 3.5mm * 2.8mm. In contrast, SMD5050 has a dimension of 5.0mm * 5.0mm. So, the light-emitting surface of SMD5050 is much higher than SMD3528.
- In terms of brightness, SMD5050 produces three times greater illumination than SMD3528. Thus, it is more suitable for ambient and task lighting.
- SMD3528 is a single-diode chip. In comparison, SMD5050 is a three-in-one chip. That is, it can have three different diodes in a single chip. Thus, it gives excellent brightness and open options for multi-color lighting.
- RGB lighting is structured using SMD5050 chips. It easily fits the red, green, and blue diode in its three-in-one chip. Thus, with the SMD5050 chip, you can produce millions of hues. But, SMD3528 is suitable only for monochromatic lighting. In contrast, SMD5050 can have both monochromatic and RGB lighting.

So, considering these factors, SMD5050 offers higher brightness and better lighting options. But only a few SMD5050 can fit per foot of PCB due to larger chip sizes. Thus, it creates a brightness restriction for SMD5050. On the other hand, more SMD3528 can fit in PCB/foot. Besides, SMD3528 is also

cost-effective. So, if you want high density single color lighting, SMD3528 is an ideal choice.



What Are Other Numbers Used in LED Strip Lights?

Besides the most common LED numbers, 2835,3528, and 5050, many other chip sizes are available for LED strips. These are-

- SMD1808: With a size of just 1.8*0.8mm, SMD 1808 is among the most minor LEDs.
- SMD2010: An alternative to the SMD1808 is the SMD2010, which has a dimension of just 2.0*1.0mm.
- SMD3014: The dimension of the LED is 3.0mm * 1.4mm. The SMD3014 strips of LEDYi are available in two variants, front-emitting and side-emitting.
- SMD2216: They have a dimension of 2.2mm * 1.6 mm. Due to the smaller lamp size, these SMD2216 LED strips can be narrower, and the LED density can be denser.
- SMD2110: It has a dimension of 2.1mm * 1.0mm. SMD2110 is an upgraded version of the SMD2216 with a thicker bead holder that makes it robust.
- SMD5630: SMD5630 are the brightest LED strips with a dimension of 5.6mm * 3.0mm.

Do Bigger LED Chips Use More Electricity?

The chip size is related to electricity consumption, but the idea that bigger LED chips use more electricity is partly true. It highly depends on the technology rather than just the chip sizes. Let me explain the concept with an example of our LEDYi 60 LEDs LED strips for different SMDs:

LED numbers	Current (A/m)	Power(W/m)
SMD5050	1.2A(12V) / 0.6A(24V)	14.4W
SMD3528	0.4A(12V) / 0.2A(24V)	4.8W
SMD2835	1A/0.5A	12W

As you can see, SMD5050 uses more electricity, which is ok as it has a larger chip size. But between SMD2835 and SMD3528, SMD2835 is the smallest in size. So, it is supposed to consume less electricity. But in reality, 2835 produces more brightness, so it uses more electricity than 3528.

Higher Density vs. Bigger LED Chips: What Is Better?

We discussed size throughout the article, but you might wonder if density is essential. The term "density" might confuse you, but it simply refers to the number of LED chips on the strip per meter.

Density = Number of Chips * Meter

Now, bigger LED chips give a brighter light. But with bigger chips, you can fit only a few SMDs per meter of your LED strip. But how are dense LED chips better?

When you have a denser LED chip, it will provide brighter and more uniform lighting. For example- about 120 LED chips as small as SMD2835 can easily fit in a one-meter strip. Thus, it gives much brighter illumination- up to 2,600 lumens per meter! It will further provide more uniformity than less dense lighting. In contrast, you can fit 30 to 60 LEDs in one meter SMD5050.

However, it doesn't mean you must choose highly dense LED strips for uniformity. Bigger chips can also bring uniformity, for this cove lighting works best.

RGB vs. RGBW vs. RGBIC vs. RGBWW vs. RGBCCT LED Strip Lights

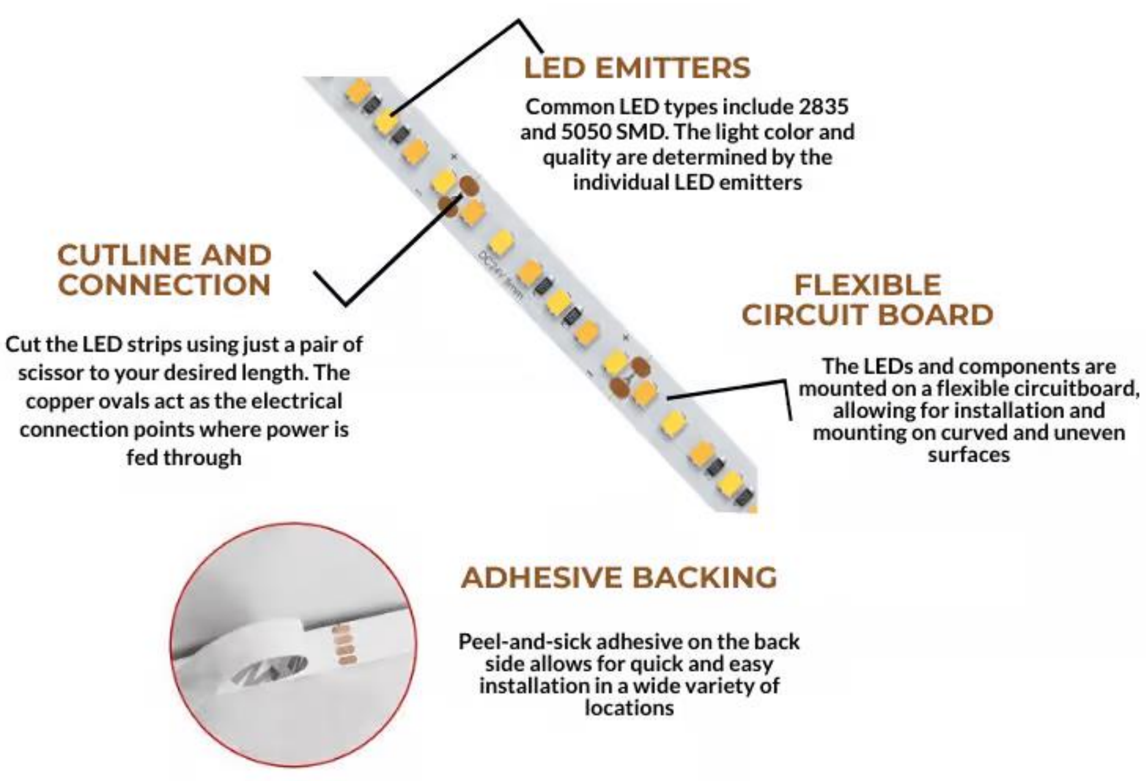
Are you thinking of having a super color combination for your smart home, office, or workplace? This may drive you into the deep sea, full of confusion and absurdity that you cannot spell out. And you will see several options when choosing LED lights to get a premium feel. So, I will share every ins and outs with distinctions between RGB vs. RGBW vs. RGBIC vs. RGBWW vs. RGBCCT LED Strip Lights in this comprehensive guide.

RGB, RGBW, RGBIC, RGBWW, and RGBCCT indicate the color variations of LED strip lights. They have different diode combinations that make them unique. Besides, RGB, RGBW, and RGBWW have differences in the tone of white. And other LED strips can’t produce the multi-color effect as RGBIC LED strips.

So, read further to learn more differences between them-

What is LED Strip Light?

LED strips are flexible circuit boards with densely arranged SMD LEDs. These strips have adhesive backing that supports surface mounting. Plus, LED strips are flexible, bendable, durable, and energy-efficient. They also come in a wide range of colors. That makes them versatile and ideal for multi-purpose lighting.



What Do The Below Letters Mean In LED Strips?

The term LED stands for Light Emitting Diode. These diodes are paced in several chips and arranged densely on a LED strip.

A single LED chip can have one or more than one diodes. And the color of these diodes is indicated by the initials of the color name. So, the letters on the LED strip define the color of the emitted light. Here are some abbreviations that you should know to understand the shades of LEDs better-

RGB- Red, Green, Blue

W- White

WW- White and Warm White

CW- Cold White

CCT (Correlated Color Temperature)- Cold White (CW) and Warm White (WW)

IC- Integrated Circuit (built-in independent chip)

Label	Description
RGB	A single three-channel LED chip with Red, Green, and Blue diodes
RGBW	One four-channel LED chip with Red, Green, Blue, and White diodes
RGBIC	A three-channel LED chip with Red, Green, and Blue + a build-in independent Chip
RGBWW	One four-channel chip with Red, Green, Blue, and Warm White
RGBCCT	Five-channel chip with Red, Green, Blue, Cold White, and Warm White

What is RGB LED Strip Light?



RGB LED strip indicates a 3-in-1 chip of red, green, and blue color. Such strips can form a wide range (16 million) of shades by mixing red, green, an

d blue. An RGB LED strip can also produce a white hue. But the white by these strips is not pure white.

Yet, the color-producing capability of RGB depends on your controller type. An intelligent controller allows mixing options to create your desired color in the strips.

What is RGBW LED Strip Light?



RGBW LED strips contain a 4-in-1 chip with red, green, blue, and white LEDs. So, besides the million hues produced with RGB, RGBW adds more combinations with the extra white diode.

Now, you might question why to go for the extra white shade in RGBW when RGB can produce white. The answer is simple. The white in RGB is emitted by combining red, green, and blue. That is why this color is not pure white. But with RGBW, you will get a pure shade of white.

What is RGBIC LED Strip Light?



RGBIC combines a 3-in-1 RGB LED plus a built-in independent chip. In the case of color variety, these LED Strips are the same as RGB and RGBW. But the difference is that RGBIC can bring multiple colors in a single strip at a time. Thus, it gives a flowing rainbow effect. But, RGB and RGBW cannot provide this multi-color option.

For more information, you can read The Ultimate Guide To Addressable LED Strip.

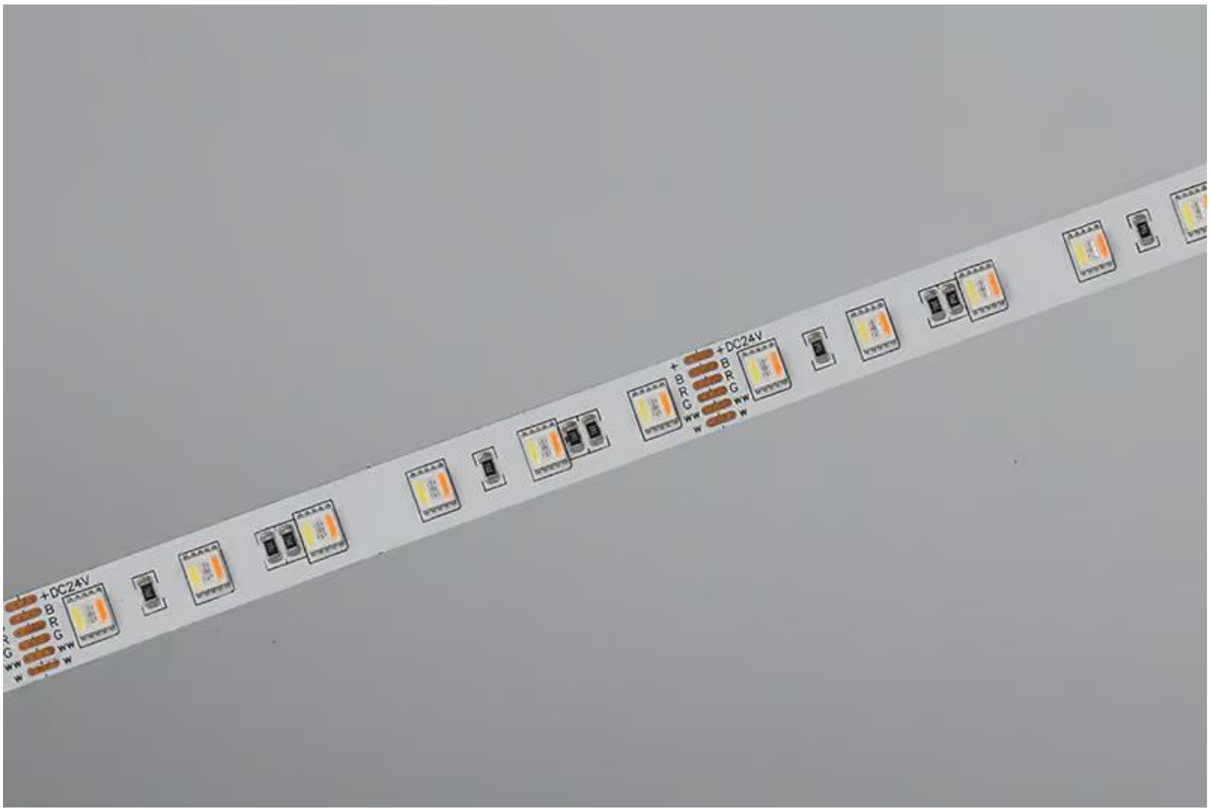
What is RGBWW LED Strip Light?



RGBWW LED strips contain five diodes in a single chip with red, green, blue, white, and warm white LEDs. It may also be formed by combining a 3-in-1 RGB chip with two separate white and warm white LED chips.

The significant difference between an RGBW and RGBWW is in the shade/tone of white hue. RGBW emits a pure white hue. Meanwhile, the warm white of RGBWW adds a yellowish tone to the white. That is why it creates warm and cozy lighting.

What is RGBCCT LED Strip Light?



CCT indicates Correlated Color Temperature. It allows CW (cold white) to WW (warm white) color-adjustable options. That is, RGBCCT is a 5-in-1 chip LED, where there are three diodes of RGB along with two diodes for white (cold and warm white).

For different temperatures, the color of white appears different. With RGBCCT, you get the option to adjust the color temperature. And thus can choose the ideal white shades for your lighting.

Thus, including CCT with RGB allows you to get yellowish (warm) to bluish(cold) tones of white. So, if you are looking for customizable white lighting, RGBCCT LED strips are your best choice.

RGB Vs. RGBW

The differences between RGB and RGBW are-

- RGB is a three-in-one chip with red, green, and blue diodes. In contrast, RGBW is a 4-in-1 chip, including an RGB and a white diode.

- RGB LED strips combine the three primary colors and can produce 16 million (approx) shade variations. Meanwhile, the extra white diode in RGBW adds more variations in the mixing of the colors.

- RGB is cheaper than RGBW. That is because the white diode added to the RGBW makes it expensive compared to RGB.

- The white hue produced in RGB is not pure white. But the white light with RGBW emits an accurate shade of white.

So, if you are looking for affordable LED strips, you should go for RGB, considering the above differences. But, the RGBW is best for more accurate white lighting.

RGBW Vs. RGBWW

The differences between RGBW and RGBWW LED strips are as follows-

- RGBW contains four diodes in a single chip. Meanwhile, RGBWW has five diodes in a single chip.

- RGBW has only one white diode. But RGBWW has two white diodes- white and warm white.

- An RGBW gives pure/accurate white lighting. In contrast, the white of RGBWW gives a warm (yellow) tone.

- The price of RGBWW is a bit higher than RGBW. So, RGBW is a cheaper option compared to RGBWW.

Hence, these are the major differences between RGBW and RGBWW.

RGB Vs. RGBIC

Now let’s look at the differences between RGB and RGBIC below-

- The RGB LED strips consist of 3-in-1 LED chips. In contrast, RGBIC LED strips consist of 3-in-1 RGB LED chips plus one independent control

chip.

- The RGBIC LED strips can produce a flowing multi-color effect. All the color combinations formed with red, green, and blue will appear in segments creating a rainbow effect. But RGB doesn't produce colors in segments. It will only have a single color throughout the strip.

- RGBIC LED strips allow you to control the color of each segment. But, the entire strip of RGB produces a single color. So, no facilities for color changing in segments with RGB LED strips exist.

- RGBIC offers you more creative lighting combinations than RGB.

- RGBIC is quite expensive in comparison to RGB. But that's entirely fair, as RGBIC provides you with a wide range of coloring and controlling options. So, it is worth the price.

Therefore, RGBIC is an excellent option if you are looking for more sophisticated lighting for your place. But, considering the price, you can also go for RGB.

RGB vs. RGBW vs. RGBIC vs. RGBWW vs. RGBCCT LED Strip Lights

Let's go through a side-by-side comparison between RGB, RGBW, RGBIC, RGBWW, and RGBCCT-

Feature	RGB	RGBW	RGBWW	RGBIC	RGBCCT
Number of Diodes/chip	3	4	5	3+ build-in IC	5
Light Intensity	Bright	Ultra-Bright	Ultra-Bright	Ultra-Bright	Ultra-Bright
Color Shifting	Single	Single	Single	Multiple	Single

Cost	Normal	Medium	Medium	Expensive	Expensive

How to Choose Between RGB, RGBW, RGBIC, RGBWW, And RGBCCT LED Strip Lights?

You may get confused when choosing the ideal LED strip for your lighting project. No worries, here I've discussed how to choose between all these LED strips-

Budget

Considering the price, the most reasonable option for LED flexible strips is RGB. These LED strips come in 16 million different hues with a combination of red, green, and blue. Again, if you are looking for white color LED strip, RGB can also work. But for pure white, RGBW can be your best pick. Plus, it is reasonable compared to RGBWW. Yet, if the price is not a matter of consideration, RGBCCT is excellent for adjustable white hues.

Permanent White

When choosing white, you must consider the tone of white you want. For instance, if you want pure white, then RGBW is an ideal choice. But, again, for a warm white, RGBWW is best. This LED strip will give you a yellow-white creating a warm and cozy atmosphere.

Adjustable White

RGBCCT is the best option for adjustable white color LEDs. This LED strip allows you to choose different shades of white. You can choose from a warm to cool tone of white, each of which will give a different outlook. RGBCCT is excellent because it combines all the functions or combinations of RGB, RGBW, and RGBWW in it. So, no doubt it is a better option. But these advanced features also make it expensive compared to the other LED strips.

Color Changing Option

The color-changing options for LED strips vary with the type of strip and controller you use. With RGB, you get 16 million color-combining options. And the inclusion of extra white in RGBW and RGBWW adds more variations to th

ese combinations. Yet, RGBIC is the most versatile color-adjusting option. You can control the color of each segment of an RGBIC LED strip. So, you get multi-color in a single strip when going for RGBIC.

Therefore, analyze the above-mentioned facts before choosing any of the LED strips.

How to Choose RGB, RGBW, RGBIC, RGBWW, and RGB-CCT LED Strip Controllers?

LED strip controller is a crucial component to consider while installing a LED strip. The controller works as the switch of the strips. Moreover, the color changing and dimming are all controlled by it.

There are numerous options for selecting an LED strip controller. These are -

RF LED Controller

RF stands for radio frequency. Thus, the LED controller that controls the LED lighting with a radio frequency-operated remote is called an RF LED controller. Such LED controllers are popular in the budget-friendly category of LED controllers. So, if you are looking for an affordable LED strip-controlling option, the RF LED controller is a good choice.

IR LED controller

IR LED controllers use infrared rays to control LED strips. They can work within a range of 1-15ft. So, if you choose an IR LED controller, you must keep the controlling distance in mind.

Tunable White LED Controller

The color temperature of LEDs is controlled with a tunable white LED controller. Such a controller can give you the desired shade of white by adjusting the color temperature. For example- at 2700K, the output white light will produce a warm tone. Meanwhile, for a calm tone of white, you need to set the color temperature to more than 5000k. Thus, for adjustable white colors, go for a tunable white LED controller.

Programmable LED Controller

Programmable LED controllers are your best choice for color customization. They provide you with DIY coloring options. So, you can mix red, green, and blue at your desired proportion and make customized colors.

DMX 512 Controller

DMX 512 controller is ideal for large installations. These LED controllers can change the color of LEDs tuning with music. So, the light game you watch at live music concerts is due to the magic of the DMX 512 controller. You can also go for this LED controller syncing it with your TV/monitor.

0-10V LED Controller

A 0-10V LED controller is an analog light-controlling method. It controls the intensity of LED strips by changing their voltage. For example, dim the LED controller to 0 volts to get the minimum intensity level. Again, adjusting the LED controller to 10V will produce the brightest output.

Wi-Fi LED Controller

Wi-Fi LED controllers are the most convenient LED controlling system. All you need to do is to connect the Wi-Fi connector to the LED strip (RGB/RGBW/RGBWW/RGBIC/RGBCCT) and control the lighting through your smartphone.

Bluetooth LED Controller

Bluetooth LED controllers are compatible with all LED strips. Connect the Bluetooth controller to your strip, and you can easily control the lighting with your phone.

So, in selecting a LED controller for RGB, RGBW, RGBIC, RGBWW, or RGB-CCT LED Strip, first, choose what effects you want. A programmable LED controller is your best choice for a more versatile color-adjusting option. Again if you are looking for large installations, go for the DMX 512 controller. Though it has a complex setup, you can also use it for smaller lighting projects.

Besides, tunable white LED controllers are ideal when you are looking for adjustable white tones. Apart from all these, you can also go for RF and IR LED controllers for affordable controlling options.

How to Connect an LED Strip Light to an LED Power Supply?

You can easily connect an LED strip light to an LED power supply by following a few simple steps. But before that, let's know the equipment that you will require -

Required Equipment:

- Wires (Red, black)
- LED power adapter
- Soldering iron
- Cone-shaped wire connectors
- Power plug

After collecting this equipment, go straight to the below steps to connect the LED strip light to the LED power supply-

Step:1: Ensure the voltage of the LED strip light and power supply are compatible. For example, if the voltage of the LED strip is 12V, the LED power adapter should also have a voltage rating of 12V.

Step:2: Next, connect the positive end of the LED strip with a red wire and the negative with a black wire. Use a soldering iron to solder the wires to the strip.

Step:3: Now, connect the LED strip's red wire to the red wire of the LED power adapter. And repeat the same for the black wires. Here, you can use cone-shaped wire connectors.

Step:4: Take the other end of the power adapter and connect the power plug to it. Now, turn the switch on, and see your LED strips glowing!

These simple steps allow you to connect the LED strips to the power supply.

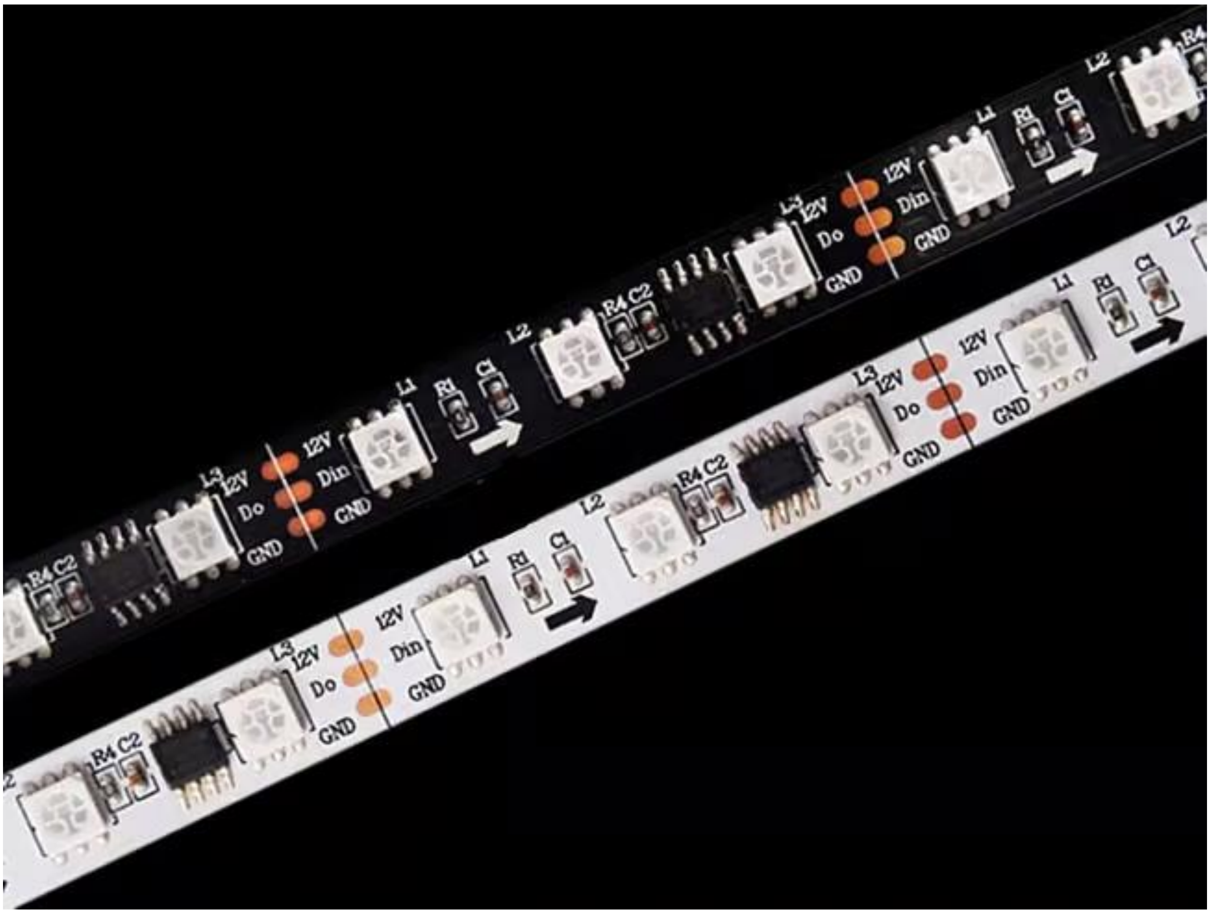
For more information, you can read How to Connect LED Strip to Power Supply?

WS2811 VS WS2812B

Addressable LED strips raise the benchmark to a whole new level. They give you more options and more excellent lighting effects such as running chases, flowing fades, meteor trails, and much more. You can even design your lighting effects with the control system.

But there are so many types of addressable LED strips that it is difficult for people to distinguish them correctly. For example, what people ask most is what is the difference between WS2811 and WS2812B.

What Is WS2811?



The WS2811 is a simple addressableRGB LED strip. It means that you can show each LED color with the help of an information signal. You can get these si

gnals from several places, like the digital pin on an Arduino board or a suitable SPI RGB LED controller.

It is essential to know that this information signal is a pulse-width-modulated (PWM) heartbeat. The most important thing to remember is this. Pulse width modulation, or PWM, is what gives LEDs their power. The word comes from the ws2811 driver IC, which is where it got its start.

People often know these LEDs by their acronym, ws2811. This addressable RGB LED ws2811 is powered by DC 12V, so the voltage difference can be seen. Even if DC 12V is used to power the WS2811 RGB LED Controller we are building today, it can still do its job.

For more details, you can download the [WS2811 specification].

What Is WS2812B?



Inside the WS2812B intelligent control LED light source is a package of 5050 parts, including the control circuit and the RGB chip. It has a signal-reshaping amplifier drive circuit, and an intelligently-processing digital port data latch. Also built into the device are a precision internal oscillat

or and a programmable constant current control element. These parts work together to keep the pixel point light' s color height the same.

In the data transfer protocol, there is only one NZR communication channel. After the pixel has been turned on and reset, the controller will send the data to the DIN port. The first pixel will get the first 24-bit data and send it to the internal data latch. The internal signal of the amplification circuit shapes the other data, which is then sent through the DO port to the next cascade pixel.

After the signal has been sent, it is cut down to 24 bits for each pixel. Pixels use auto-reshaping transmit technology, which means that the number of pixels in a cascade is not limited by how fast the signal can be sent. LEDs run on a low voltage, which is good for the environment and saves a lot of power. They also have a high level of brightness, a wide angle of scattering, good uniformity, low power use, and a long lifespan. The integrated control chip in LEDs is changing to become a circuit with fewer parts, less space, and an easier way to put it together.

For more details, you can download the WS2812B specification.

What Is The Difference Between The WS2811 And The WS2812B?

For the WS2811 LED chip to work properly, it needs a voltage of 12 volts. In contrast, the WS2812B chip only needs 5V to operate. When you use an LED strip with many LEDs, the voltage will drop a lot along the length of the strip. This means that the last few LEDs at the end of the strip and farthest from the board will have a lower voltage.

For example, your strip has 30 LEDs, and the voltage drops by 2V near the end. The WS2811 chip will control the rest of the LEDs, and each will get about 10V. For a 12V LED, this is still fine because it was made to work with that voltage. If you use a WS2812B that operates at 5V, the voltage drop you experience will be 3V, not the 5V that is reported. Right there, the voltage has significantly dropped there.

	WS2811 LED Strip	WS2812B LED Strip

Integrated Circuit	External	Built-In
Voltage	DC 12 Volts	DC 5 Volts
Color	RGB	RGB
LED Per Meter	60 LEDs Per Meter	60 LEDs Per Meter
Power Consumption	14 W/M	18 W/M
Wires	Positive + Negative + Single Data Line	Positive + Negative + Single Data Line

Differences In LEDs Controlled Between WS2811 And WS2812B

The WS2811 can’t be used to control even a single LED on its own. Instead, it controls three LEDs that are grouped together. Because you can’t control them in groups of less than three LEDs, you can’t control them at all. On the other hand, each WS2812B can only run one LED at a time. If you only need to control one LED at a time, you should choose the WS2812B instead of the WS2811 because it has a finer control granularity.

Differences in LEDs Controlled Between WS2811 vs. WS2812B

	WS2811 LED Strip	WS2812B LED Strip
Control Mode	3 LEDs Group Control	Individual Control
IC Quantity [60 LEDs/Meter For Example]	20 Pcs	60 Pcs

Differences In Power Consumption Between WS2812B And WS2811

Because it runs on 12V, the WS2811 uses much more electricity. The WS8212B, on the other hand, uses much less power because it works on 5V.

Pros And Cons Of WS2811 And WS2812B

Pros Of WS2811

- Twelve volts give it the power it needs to work. Because of this, it can control many LEDs in a strip.
- This makes it easier to work with many LEDs straightforwardly.

Cons Of WS2811

It can only control a maximum of three LEDs at any given time. Because of this, the control granularity level with the least amount of granularity is three LEDs. Because it runs on 12V, it uses a lot more power.

Pros Of WS2812B

- Each LED has an on/off switch that can be turned on or off.
- In the LED system, each piece of control is represented by a single LED.
- The amount of power that is used goes down.
- For the WS2811/WS2812B to work, it needs data to match at a specific moment. The WS2812B is cheaper and easier to make, and each RGB LED takes up much less space on strips.

Cons Of WS2812B

- Since it runs on 5V, the voltage will drop noticeably as the number of LEDs in the strip increases.

Summary

Whether you should use the WS2811 or the WS2812B will depend on how you plan to use it. The WS2811 chip is the best choice for controlling a long LED strip.

Furthermore, if you want to control LEDs down to the level of a single LED, the WS2812B is the part you should use. Both the WS2811 and the WS2812B come with their own set of benefits and drawbacks, so you should consider your needs before making a decision between the two.

WS2812B VS WS2813

The WS2812B is one of the most widely used addressable LED strips and a go-to for the foundation of flashing designs due to its low operating voltage, high brightness, and good color depth. The WS2812B is a smarter way to control LED lighting, thanks to its upgrade from the original WS2812. This revision integrates the RGB chip and control circuitry into the RGB 5050 LED. This LED is digital. Thus, their dedicated drivers manage the brightness and color of each individually addressed LED. This means that each LED has the potential to be a different color from the LED next to it. This opens the door to elaborate and aesthetically pleasing lighting effects.

The WS2813 addressable LED strip is the most recent version of this type of LED strip, which is used a lot. This new version of WS2812B is better than the old one. The RGB 5050 LED from WS2813 has a control circuit and an RGB chip, just like the WS2812B. This means that each LED can be controlled in its way. What makes the WS2813 different from its highly successful predecessor, the WS2812B, and what makes it the same? Since it is an updated version, we expect it to be better than the WS2812B in some ranges. Let’s look at how the two are different and how they are the same.

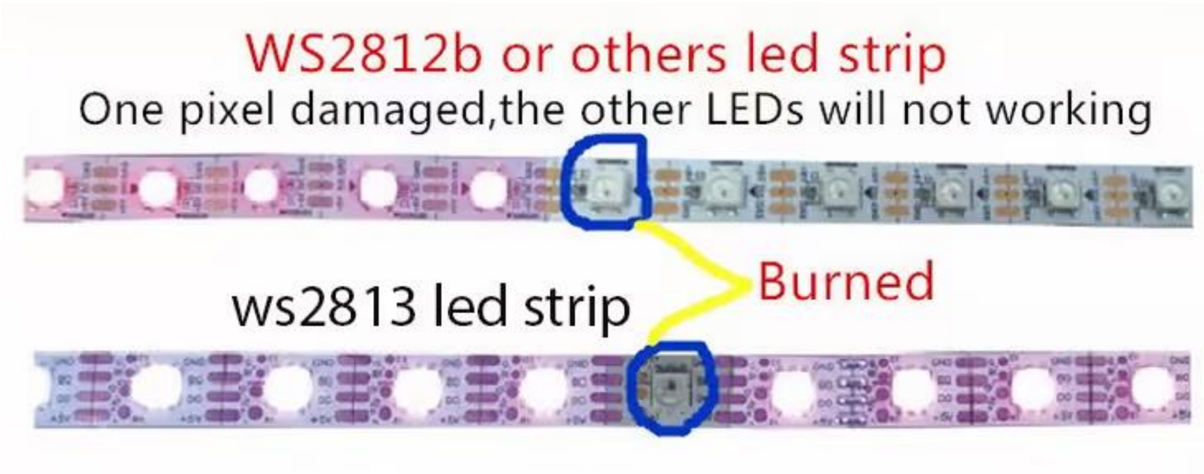
What’s The Main Difference Between WS2813 And WS2812B?

The LED bypassing feature is the distinguishing factor between these two led strips. The WS2813 is significantly improved over its predecessor WS2812B, because it can connect to two signals simultaneously. Also, the cables have places where the signal breaks so the transmission doesn’t stop. So, even if one LED in the middle of the strip burns out, it won’t mess up the circuit. As long as none of the other LEDs close by are broken, the signal will keep going to the other LEDs, and they will shine as usual. In the case of the WS2812B, the whole circuit will fail if even one LED is broken or

burned out. Once you get past the broken or burned-out LED, the other LEDs on the strip won' t light up.

The WS2812B only has one data signal, which is why there is a difference. Because of this, a damaged light-emitting diode, such as one that is burned out or cracked, can stop the next diode in the strip from working correctly. On the other hand, the WS2813 uses two data signals. This means that if a pixel in the chain of LEDs fails, it won' t stop the data flow. On the other hand, if two LEDs close to each other are broken or burned out, the signal transfer will be slowed. Even if one LED in the chain is broken, it won' t be a big deal. You can keep working with the other LEDs while you think about how to fix the problem.

When compared between the two, it' s clear that the WS2813 is the most reliable LED strip.



For more details you can download the below specification:
[WS2812B specification]
[WS2813 specification]

How Is The Frequency Of The WS2813 Different From That Of The WS2812B?

The WS2813 LED strips have a higher frequency rate than their predecessor, the WS2812B, which gives them an extra benefit. Compared to its predecessor, the WS2812B, which only has a frequency of 400 hertz, this model has a much higher frequency. Its refresh rate is 2,000 hertz, which is a lot more than 400 hertz.

So, the WS2813 has an excellent display effect with almost no flickering.

How Does The Reset Time Of The WS2812B Compare To The WS2813?

The WS2813 has a reset time of 250 microseconds, which lets it work better at lower frequencies and with less expensive microcontrollers.

Can We Use The Same Controller For Both WS2813 And WS2812B?

The good thing is that both the WS2812B and the WS2813 can use the same controller.

You probably don't know much about LED strips, right? If this is the case, you might not know that just plugging them into an electrical outlet won't make them light up. Also, it's harder to change the colors with regular passive LEDs, and the lights don't stay on all the time. It needs to be hooked up to a controller so that a valid command can be sent to the LEDs through it. Controllers include the Arduino, which is used by many people, and the Raspberry Pi. Using the settings you have programmed into the controller, the controller "tells" each LED what color it should be, how bright it should be, and how long it should stay in that state.

The integrated circuit (IC) found in WS2812B LEDs makes it possible for the LEDs to communicate with a single cable. This allows you to manage a large number of LEDs from a single pin on your controller. There are three pins on the LED strips for power (+5V), ground (GND), and data (Din and Dout). Connecting power and ground pins to your strip ensure it receives power, while the data pin enables it to communicate with the controller.

If you want to use an Arduino to control a strip that needs 5V of power, you shouldn't have any trouble doing so with the 5V output on the board. On the other hand, if you want to run your LED strip with a Raspberry Pi or an ESP8266, which sends signals at 3.3V, you will need a logic-level converter module to change the data signal from 3.3V to 5V. Signals are sent from these devices at 3.3V. Unless you do this, the LED strip you use might not work.

Do Both WS2813 And WS2812B Use The Same Libraries?

Both the WS2813 and the WS2812B use similar libraries. These two strips require libraries to be downloaded before they can be controlled to produce crazy LED lighting effects. These libraries regulate each LED, allowing for the generation of elaborate patterns. However, the controller in question affects the availability of specific libraries. The majority of these libraries are freely downloadable from the internet.

With your ESP8266 and Arduino devices, you can use the following libraries:

- fastLED
- Adafruit_Neopixel
- WS2812FX
- For raspberry pi, you can utilize the following libraries: Rpi_ws281x python libraries

Will The Power Supply To A WS2812B Strip Be Different From A WS2813 Strip?

At full brightness, both LEDs require around 60mA of current, therefore WS2812B systems can use the same types of power sources. The amount of power required will always differ from one set of LED strips to the next. To keep your strip at the right brightness, you' ll need to use a power source that can handle the current draw. To power a single strip of 60 LEDs at their maximum brightness, you' ll need a power source rated for at least 3.6A (60 LEDs x 60mA). Using a USB 2.0 port that supplies 0.9A, you can safely run strips of 0.9A/0.06A = 15 LEDs.

How Do The Prices Of WS2813 And WS2812B LEDs Compare?

The fact that the WS2813 is more expensive than its predecessor shouldn' t come as a surprise. Based on what we found in our research, the price of a WS2813 LED strip is about 20% more than that of its predecessor, the WS2812B. The price difference between these two LED strips is not very big. Even though the WS2813 has been on the market for a while, it is slowly becoming increasingly popular. In the long run, it might be better than the model that came before it.

If you’re a beginner and want to buy ws2813 LED strips, we recommend getting the waterproof WS2813 LED strip instead. These LED strips are free to use, easy to put together, and ready to use immediately. These LED strips are called “building blocks,” and it has been shown to be a very efficient way to make electronics. For your project, you won’t have to learn how to use a breadboard, which is hard because you’ll be using waterproof WS2813 LED strips instead. Now, instead of going through a long list of steps, you can build your project quickly and easily.

It is also waterproof, so you don’t have to worry about how water will affect the project you are working on because it won’t hurt. Still, they are not too expensive. Also, because they have been on the market for a long time, there is a lot of information about them.

Summary

We’ve talked about the WS2182B and WS2813 LED strips, two of the most popular addressable LED strips on the market. The brightness of these LED strips is good. Even though they are different in some ways, they all do very well.

Candela vs Lux vs Lumens

People measure lights using different units like Candela, Lux, and Lumens. Have you ever thought about evaluating lights applying any of these units?

You may get into trouble doing so because the light measuring units Candela, Lux, and Lumens often interchange. So I decided to save you from this confusion by bringing up their differences.

The units Candela, Lux, and Lumens measure the intensity of light. Lux refers to the quantity of light that reaches an object. And Lumens and Candela are the metrics used to check the amount of light emission.

Yet, these three terms are often misused while determining the light’s brightness. That is why you should know what they mean and what factors separate the units from each other.

Let’s dive into the discussion to know further.

What is Candela?

Candela states the Luminous Intensity of a light source. This term originated from the Latin word ‘Candela’ and is related to the intensity of a candle. For instance, one Candela is approximately equal to the brightness of a candle.

In lay terms, Candela measures the intensity of light in a particular direction or angle. Not clear? Think of laser light; it directs the light in a specific direction. That is why the Candela rate is the highest in laser or spotlights.

What is Lux?

Lux (lx) is the measuring unit for illumination. It indicates the quantity of light reflected per square meter.

So, for a Lux rating, you need to consider the room’s area or the light source’s distance from a particular point. In this case, the value of Lux is inversely proportional to the square to the length. That is, as the distance increases, the value of Lux decreases. Thus, the light that seems bright in a small room will not look as bright when put in a large room.

In book words, Lux is expressed as - 1 lx is equal to $1lm/m^2$. That is, the value of Lux depends on Lumens (lm). So, let’s jump into Lumens to learn Lux better-

What is Lumen?

The value of Luminous Flux is measured in Lumen (lm). It is the most used term to express the intensity of lights.

Lumens state the total capacity of a light source. That is, the overall brightness that light produces is Lumens. Unlike Candela (cd), Lumens doesn’t calculate the illumination from a particular direction. Rather it indicates a raw Lumens.

This raw Lumen measures the brightness of the light source from all sides. As a result, regardless of the light output angle, the value of Lumen remains constant.

Furthermore, Lumens value varies with the light's type, color, and power source.

Candela vs Lux vs Lumens - What Are The Differences?

The primary differences between Candela, Lux, and Lumens are as follows in the table below-

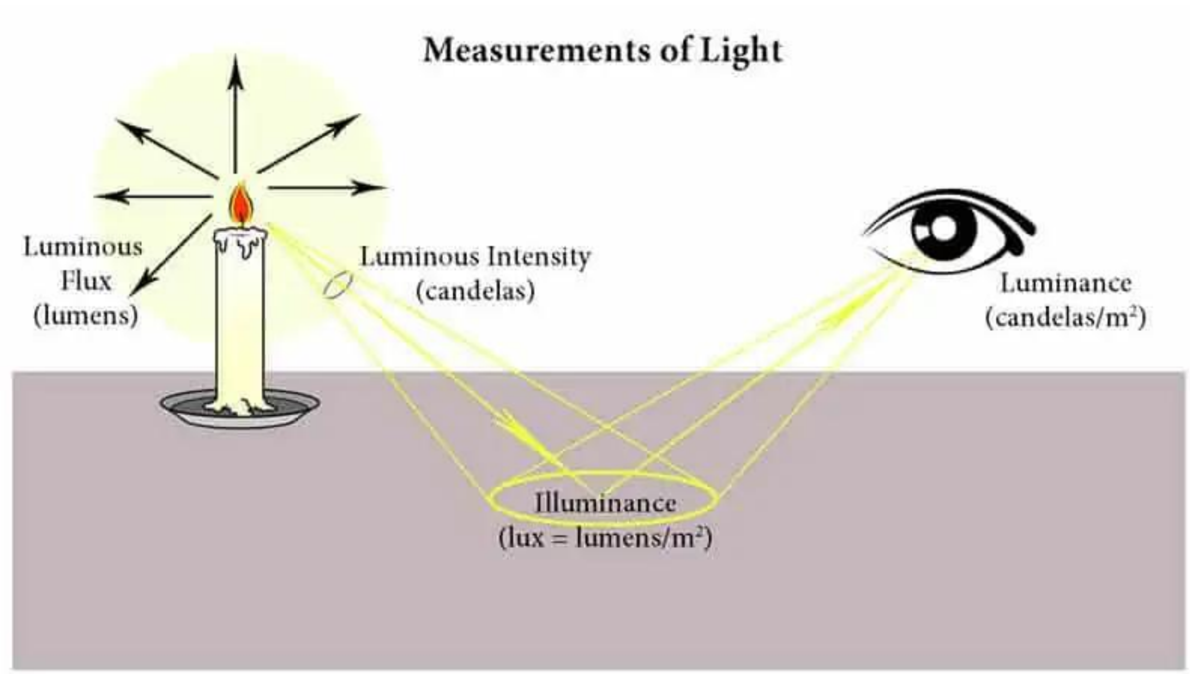
Specifications	Candela	Lumens	Lux
Definition	Candela is the brightness level of a light source at a particular angle and direction.	Lumen indicates the total output of light in all directions.	The amount of illumination that strikes per square meter area is Lux.
Measuring Unit Of	Luminous Intensity	Luminous Flux	Illuminance
Symbol (SI)	cd	lm	lx

Candela is the measuring unit of Luminous Intensity. Meanwhile, Lumen and Lux are the units for Luminous Flux and Illuminance.

In simple words, Candela indicates how bright a light source is; Lux measures how bright an object seems in the light source. And Lumen shows the total output the light source provides.

The distance change affects the value of Lumen and Lux, but Candela remains constant. That is because Candela's value depends on angles instead of distance.

Candela vs Lux vs Lumens - How They Relate?



The most common relation among these three terms is that they all are the measuring unit of light. To clarify the concept, let's get to the root of these terms-

Lumens is a derivative form of Candela. Both terms measure luminous; that is, they state the brightness of a light source. The difference is that lumens take account of light beams from all directions. In contrast, Candela considers that for a particular direction.

Again, the unit Lux is the measurement of Lumens per square meter. It is a derivation form of Lumens. In mathematical terms, 1 lx = 1lm/m^2. This equation provides a more accurate representation of light's brightness than Lumens.

And a more interesting fact is that Lux is the metric version of foot candles (an old term referring to Candela).

Derived from Derived from Lux ———————→ Lumens ————————→ Candela 1 lx = 1 lm/m2 = 1 cd • sr/m2

Thus, Candela, Lux, and Lumens are interrelated with each other. Yet, they state three separate identities, but they are connected and convertible.

A full sphere has a solid angle of 4π steradians, so a light source that uniformly radiates one candela in all directions has a total luminous flux of

$1\ \text{cd} \times 4\pi\,\text{sr} = 4\pi\ \text{cd} \cdot \text{sr} \approx 12.57\ \text{lm}$.

Factors Affecting The Value Of Candela Vs. Lux Vs. Lumens

The values of Candela, Lux, and Lumens fluctuate for the following factors:

Distance

The distance between an object and the light source affects the values of Lux and Lumens. That is because the square of the distance is inversely proportional to these units.

Increasing the length by two times, the value of lx will reduce to 1/4th of the initial values. But distance doesn’t affect the value of Candela, as it concerts with angles rather than distance.

Angle Of Radiance

The angle produced by the light source affects the illumination. The smaller the angle is, the more the value of Candela and Lux; the brighter the light is.

Moreover, illumination area increases for larger angles of radiance, keeping the value of lm constant.

Luminous Efficiency

Luminous efficiency measures the ability of a light source to produce bright lights. It depends on the power source’s Wattage and Lumens rating. The luminous efficiency increases as the Watt value decreases.

That is, the greater the luminous efficiency is, the brighter the light is.

Which is The Standard Light Measuring Unit For LED Strip?

The standard light measuring unit for LED Stipe is Lumens. But, we often make mistakes measuring the brightness of LED stripes with Wattage. That is entirely an unfair practice as different light has different luminous efficiency.

So, the correct way to judge the performance of a LED stripe is with Lumen per foot/meter.

However, the value of Lumens varies with the color of the LED stripe. For instance, white LED stripes have a higher Lumen value than colorful LED stripes.

How Do Lumens & Wattage Relate?

Lumens indicate the total output a light source produces, whereas Wattage is the energy used to run the light. Still, to judge the light' s performance, you must consider the light' s efficiency by knowing the lumen and Wattage value.

In this case, energy-saving bulbs are the most efficient. Because they produce a higher lumen rate utilizing the least energy (Wattage). That is why they are called energy-saving bulbs.

The efficiency of light is calculated as Lumen Per Watt. That is

Light Efficiency, E = lm/W

So, the light' s performance increases when the efficiency improves. At the same time, high-efficient lights minimize your electric bill.

Lumen to Watts: The Complete Guide

Lumen and watts are two identical words that everyone capitalizes on when it comes to bulbs. Lumens are mainly used to determine the intensity of ligh

t emission from a bulb. However, the better the lumen depicts the brightness of the lights, whereas the infrequent lumen indicates its dimmer version.

However, watt predicts the units of power which the light has provided during emission. The greater the wattage of the bulb, the brighter the bulb's illumination will be. An 80-watt bulb glows much more colorful than a 40-watt bulb.

Lumens Explained

Lumens can be termed as the distinction which is organized to commemorate the illumination of any lighting bulb. The higher the lumen generally indicates the spaced-out luminance of the bulb and vice versa. However, to point out the exact measured unit, it's essential to figure out the reflection physics inside the lighting bulb.

Moreover, this particular measuring unit is more accurate than any other lighting unit used to establish the lumination of the bulb. Lumens also explains how the lighting spigot accomplishes its work without concerning electricity.

Lumens are denoted by "lm" and generally put forward the total visibility of the light from any light source to the human eye. However, lumens can be signified as the unit which judges the brightness of a lighting source.

However, at present, a new concept has arisen which depicts the advance of the energy-saving aspect of the light source. In this real advancement, the light's intensity and brightness are determined with less electricity consumption.

How many lumens does someone exactly expect to attain in a bright environment? So such an exact number of lumens can be explained in this context. The concept of lumens is mostly dependent upon several factors like shape and size of the room, ceilings' height, needs of the individuals, and specific type of light source.

Nonetheless, basic guidance concerning this topic is determined per Sq M (10.76 square feet). In this aspect, the dimension of the room works as a crucial feature. For different rooms of a residence, distinctive types of illu

mination are required. For the kitchen, 300 to 400 lumen/Sq M is required, whereas, for the bathroom, 500 to 600 lumen/Sq M can be considered.

Watts Explained

Everyone around the globe prefers buying every lighting bulb concerning its watt. But why? Watt represents the power unit which indicates the usage of energy of the lighting source during emission. People are pretty conscious about buying bulbs after looking at the watts.

The high range of wattage of a bulb depicts the brighter version of it or vice versa. After having a precise vision of the bulbs, you can point out the filament. It’s the ma where the electricity passes and provides brightness and warmth.

At present, advanced technology has helped to shape numerous things. Likewise, some changes have also taken place in the entire curriculum of the bulbs. The bulbs are now more efficient and don’t consume much energy and thus reduce the load on electricity bills. It’s because of the transition in fundamental working principles. However, the newly invented bulbs are much brighter than the prior ones.

Lumens Vs. Watts- Compare & Contrast

Compare

Functionality

Lumens depict the brightness of the light sources: the more lumens, the brighter the light source’s illumination, and vice versa. However, the value of the lumens differs from the type of light sources according to the lighting sources or technologies used to turn electric energy into heat energy, and watt is about the power consumed by the bulb. If the brightness of the light source increases, then it indicates the achievement of more energy-efficient lumens along with lower power consumption.

Standardization

Lumens put forward the total, or the exact value of, the light a lighting source has emitted. Estimating the brightness of a bulb is not an easy task.

So the brightness can be determined by looking at the wattage ratings of the bulb. It's because the wattage ratings indicate the brightness level of the light source.

Contrast

Relation Between Lumens And Watts

An incandescent light bulb of 100W produces an average value of 1600 lumens. Then the entire statement can be summarized by saying that the value of 1 Watt will be 16 lumens. This value can be obtained by dividing 1600 lumens by 100W.

Translation Of Lumens Into Watts

For the conversion of lumens to watts, it's essential to find out the luminous efficacy. This particular juncture of the lighting source is determined in lm/W. So to get the value of luminous efficacy, it's crucial to figure out the power and wattage of the bulb. Hence, power can be obtained by dividing flux by luminous efficacy.

Comparison Table Of Different Bulb Types

The table will illustrate the distinctive features of each type of bulb, like Incandescent, Halogen, CFL, and LED bulbs. After looking at the table, the audience can quickly note down the points which make each type different from the other.

Features	Incandescent	Halogen	CFL	LED
Consumption	100w	70w	20w	12w
Efficiency	Low	Low	Medium	High
Average Lifespan	1 year	1-2 years	10 years	25 + years
Price	Low	Low	Medium	High

Operating Cost	High	Medium	Low	Low

Lumens To Watts Conversion

1. Explain what lumen-to-watt comparison

From the above brief explanation, it’s pretty evident that lumens and watts are two parallel bulb sections. Lumen implies the measurement of the total quality of the source of light. In contrast, watts explain the power consumption amount by the bulb.

On the other hand, watts don’t clarify the brightness of the light source, but lumen can easily explain every juncture of this topic. For example, a 60W incandescent light bulb can radiate around 650-850 lumens. In this case, if 750 lumens is the average radiation, it can be quickly concluded that 1 Watt = 12.5 lumens.

2. Give the formula for conversion

In physics, the lumen is explained as lm, whereas the watt is expressed as W. Lumen is nothing but the standard unit concerning the luminous flux. In other terms, it can be stated as the emission or flow of light which comes out from the light source in any respective area per unit of time. In contrast, a watt is the typical unit of electrical power for the time. It’s measured in joules per second.

For conversion, the expression or the formula will be flux / luminous efficacy = power and lm/ (lm/W) = W. The unit of this converted expression will be lm / W.

3. Explain the conversion formula to readers

Suppose someone wanted to figure out the approximate or the exact amount of power consumed by the light source. If the light source is an incandescent light bulb, it will have a luminous flux of 1,120 lm. The luminous efficacy of an incandescent bulb is 14 lm/W. Then the energy consumed by the bulb will be = (1,120 lm) / (14 lm/W) = 80 W.

Luminous Efficacy Explained

Determination of the luminous efficacy is when the lumens are determined in terms of watts. However, in other words, it can be explained as the capability of the bulbs to convert watts to lumens. The older technology had a very low luminous efficacy.

15 lumens per watt can is the efficiency of incandescent bulbs, and the capability of LED lights can provide almost 140 lumens per watt. After observing both the units of power of different types of bulbs, the energy-saving concept of the light source is quite evident.

Watts doesn’ t play any role in determining the brightness of the lighting sources but has provided a different aspect concerning the luminous capability.

However, this efficacy is not the same for all manufacturers; it deviates. It’ s essential to check the working capacity of the company to figure out the bulb’ s efficiency. In the luminous efficacy list, LEDs have always acquired the top-notch with a luminous efficacy of 80-100 Lm/W.

Lumens Recommendation For Different Rooms

Kitchen

The kitchen is one of such corners of the house in which bright light falls under necessity. That’ s why generally, people recommend installing the range of a 1000-lumen LED to a 1600-lumen LED bulb to have an ample amount of brightness in place. However, the brightness of the light source will also assist in staying alert during cooler temperatures.

Dining Room

People tend to brighten up their dining space. For the bright ambiance, it’ s vital to get your hand around the range of 440 to 800-lumen bulbs. Apart from all, these dim light sources are considered the best for dining rooms as they work best in warmer temperatures.

Living Room

The living room is the definite place where someone can relax adequately, and sometimes people also choose to work there. It’s essential to take up the bulb range of 230 – 440 lumen.

Bedroom

The bedroom is a relaxing room where people generally prefer dim light with a soft ambiance to relax. That’s why a 230 or 270-lumen light is recommended. For this, it’s better to introduce a different, dimmer light tone.

Home Office

In the workspace, people need brighter light to put all their concentration on their work. However, in the workplace, computers or laptops are two main junctures. Looking constantly at their screen can cause harm to the eyes. That’s why a range of 800-1000 lumen bulbs should be used in the workspace.

Bathroom

Bathrooms are where some like to stay for a long time, whereas others want to come back quickly. So a range of 330 – 400 lumen light should be used in the bathroom. However, the light effects or times can be changed according to the temperature.

Workspace

You need enthusiasm and zeal to put all your concentration into work. For such energy, one needs a bright tone of light in his workspace. Nonetheless, for the workspace, an approximate range of 8,000 to 10,000 lumens is required.

1. **Ensure Reading The Light Bulb Label**

Before buying a bulb, it’s better to scroll down your eyes on the energy labels. These labels educate the buyers about the lamp’s efficiency in terms of energy. Energy labels also illustrate the maximum energy the bulb can consume or how much pressure it can exert on the electricity bill.

In a bulb, the filament acts as the catalyst, which helps in the outpour of energy and heats it. This entire procedure instigates the bulb to glow brightly. However, this procedure demonstrates the conversion of electrical power into heat energy. On the other hand, the energy labels depict how efficient the light source is.

The efficiency of the bulbs is agreed upon on a definite scale. The efficiency scale of the light source falls under the range of A++ to G. A++ indicates the most efficient juncture of the bulbs, whereas G depicts the least efficiency.

The energy label depicts the unit of power of the bulbs. In standard terms, it illustrates the watts of the bulb. Additionally, demonstrate the energy-saving theory of the bulb. Along with watts, the label also points out the brightness range or the specific brightening numerical of the bulb. Moreover, it symbolizes the lumens and hence familiarizes the buyer with the level of brightness the bulb can provide. The energy labels furthermore offer knowledge about the life span of the bulb as well.

2. Color Rendering Index

The color rendering index (CRI) is another point regarding any light source. It informs about the appearance of the colors under the bulb. The index generally falls between 0 to 100. However, Halogen bulbs have the exact color rendering index of 100.

To be very specific, CRI is used to figure out the proportion of the natural color of the light source indicated under the circumstances of any artificial white light source. However, CRI is also described with sun rays. If the CRI of a light source is 80 or more than that, then it’s considered acceptable. Whereas the CRI of 90 is much more promising than the prior ones.

3. Color Temperature

The color temperature conveys the appearance of the light emitted by a light source, especially a bulb. However, the temperature is estimated in Kelvin (K). The extent of the color temperature is measured within the range of 1,000 to 10,000.

To be very specific, in terms of residential or any commercial lighting source, the color temperature is under the scale range of 2000K to 6500K. The

capacity or any specific numerical value of the color temperature concludes whether the source of light is considered as “cool white” or “bright white” light.

The energy labels of the bulbs also elaborate on the light colors, allowing individuals to see objects. High energy-qualified light sources or bulbs have an acceptable appearance range of 2700K to 3000K (K = Kelvin). However, the higher the stars, the higher the light appearance range.

4. Light Emission Color

The frequency of light emission is determined by electromagnetic radiation. However, this emission is all because of the electrons, which are responsible for making the transition of light energy from a higher state to a lower one. However, the emission of the light energy is identical to the emitted photons within the two energy states.

The transition of each electron concerns specific energy ranges as well as differences. However, each distinctive growth helps to specify the wavelengths of the light source and thus makes prominent notifications about the emission spectrum. This emission spectrum of each element is different and doesn’t have any reference with each other.

Why LEDs?

- **Lifespan**

LEDs last more than traditional bulbs. It’s because of the advanced lighting technology integrated into LED lights. However, LED lights work almost 2-3 times more than any other bulb type.

- **Effective Directional Emissions**

The light emission technology of LEDs is made to provide light at 180 degrees and even 360 degrees of the surface around it. In other perspectives, along with providing a large spectrum of light, it also helps to control redirecting the light of the other corner of the room for glare.

- **Design Variation**

The entire structure of LED lights is generally tiny. So it provides a difference to these lights. LEDs can be used in a bunch, or sometimes they can also be used separately. The variation in the entire structure can be made according to the necessity of the users.

- **Great Color Rendering Index (CRI)**

LEDs have high CRI because these LEDs are used around the globe. As of this, the visibility of the objects is much more apparent in LED rather than in natural lights.

- **Correlated Color Temperature (CCT)**

LEDs are available in a wide range of correlated color temperatures (CCT) are available in LEDs. CCT indicates the tone of the LED lights and hence shows its variation. CCT can come up in warm, calm as well as yellowish glow. An even white tone range is also available.

- **No UV Rays Emission**

The emission of LEDs in a specific spectrum and, thus, the range of the infrared spectrum doesn't spread widely. As a result, the stretch of the UV rays is almost negligible. However, this depicts that LEDs are safe and don't contribute to the emission of UV rays.

- **Environmentally Safe**

In lighting sources, light bulbs illuminating solutions like mercury vapor or fluorescent are used to pitch in a lot of environmental pollution. However, none of the answers are incorporated in LEDs to emit light, and hence it can be termed as eco-friendly.

- **Power Consumption**

LEDs can consume less voltage or electricity, which asserts less pressure on electricity bills. It's one of the main reasons people choose LEDs over any other type of bulb for outdoor or indoor lighting.

More information, you can read Advantages and Disadvantages of LED Lighting.

What is CRI?

Lighting accuracy is critical in today's residential, commercial and industrial markets. This is measured and quantified using the Color Rendering Index (CRI), which is the industry standard for measuring a particular light's accuracy. CRI runs on a scale going up to 100, which is the CRI of a black body radiator reference light. This reference light is either an incandescent type artificial light or natural sunlight, which are the most accurate light sources available. It is worth noting that CRI is independent of Correlated Color Temperature (CCT), a term often used in conjunction with CRI when describing the properties of light. CCT measures the actual color of the light produced in Kelvins and does not have anything to do with the light's illumination accuracy.

What is the Color Rendering Index (CRI)?

A color rendering index (CRI) is a quantitative measure of the ability of a light source to reveal the colors of various objects faithfully in comparison with a natural or standard light source. Light sources with a high CRI are desirable in color-critical applications such as neonatal care and art restoration. It is defined by the International Commission on Illumination (CIE) as follows:

Color rendering: Effect of an illuminant on the color appearance of objects by conscious or subconscious comparison with their color appearance under a reference or standard illuminant.

The CRI of a light source does not indicate the apparent color of the light source; that information is given by the correlated color temperature (CCT). The CRI is determined by the light source's spectrum. An incandescent lamp has a continuous spectrum; a fluorescent lamp has a discrete line spectrum, implying that the incandescent lamp has a higher CRI.

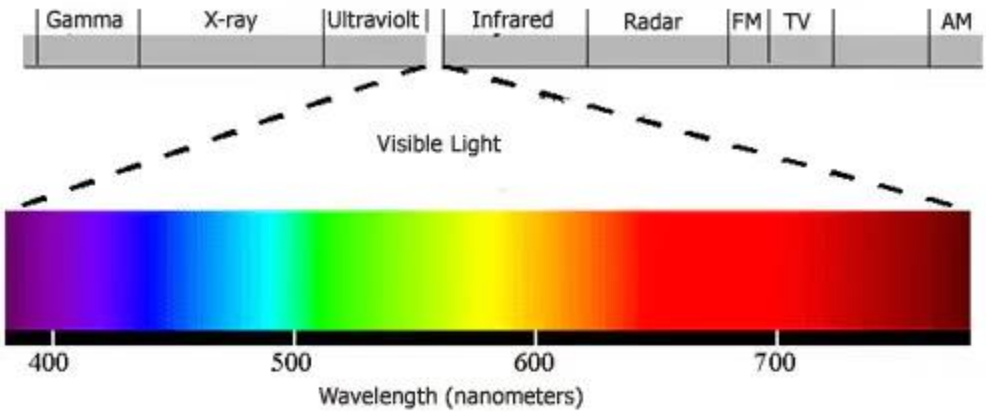
The value often quoted as "CRI" on commercially available lighting products is appropriately called the CIE Ra value, "CRI" being a general term and CIE Ra being the international standard color rendering index.

Numerically, the highest possible CIE Ra value is 100 and would only be given to a source whose spectrum is identical to the spectrum of daylight, ver

y close to that of a black body (incandescent lamps are effectively black bodies), dropping to negative values for some light sources. Low-pressure sodium lighting has a negative CRI; fluorescent lights range from about 50 for the basic types, up to about 98 for the best multi-phosphor type. Typical white-color LEDs have a CRI of 80, 90, or more.

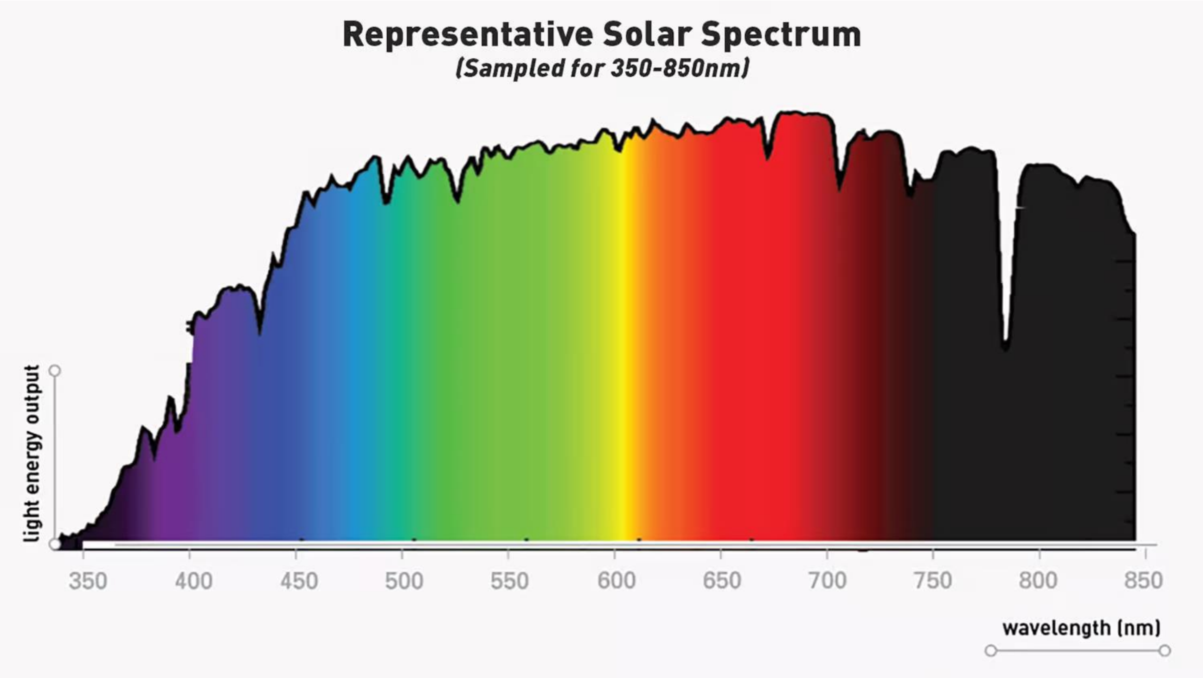
Spectral Power Distribution

The visible part of the electromagnetic spectrum is composed of radiation with wavelengths from approximately 400 to 750 nanometers. The blue part of the visible spectrum is the shorter wavelength, and the red part is the longer wavelength with all color gradations in between.



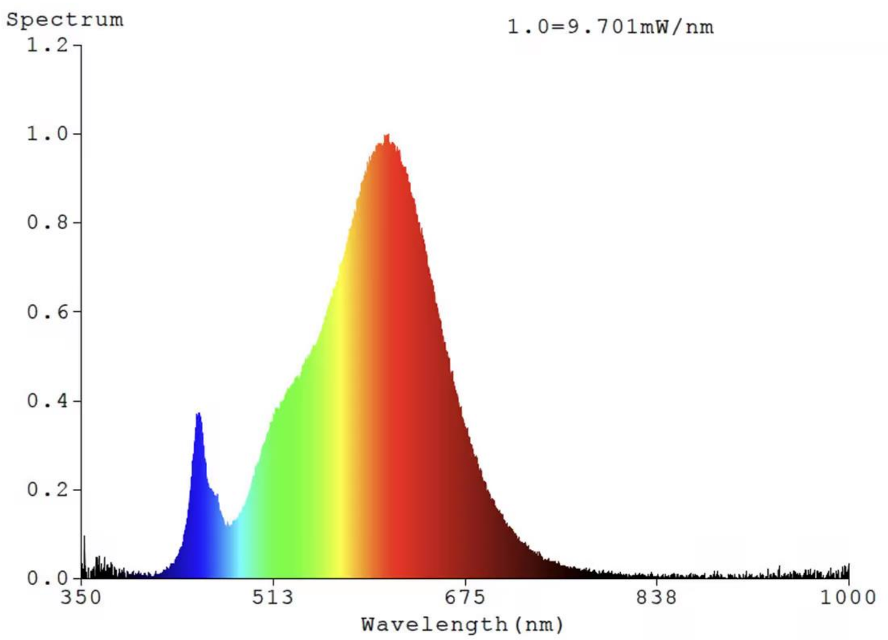
Spectral power distribution graphs show the relative power of wavelengths across the visible spectrum for a given light source. These graphs also reveal the ability of a light source to render all or selected colors.

Below see how a typical spectral power distribution graph for daylight.



Notice the strong presence (high relative power) of ALL wavelengths (or the “full-color spectrum”). Daylight provides the highest level of color rendering across the spectrum.

Compare the daylight spectral power distribution with that of a LED light.



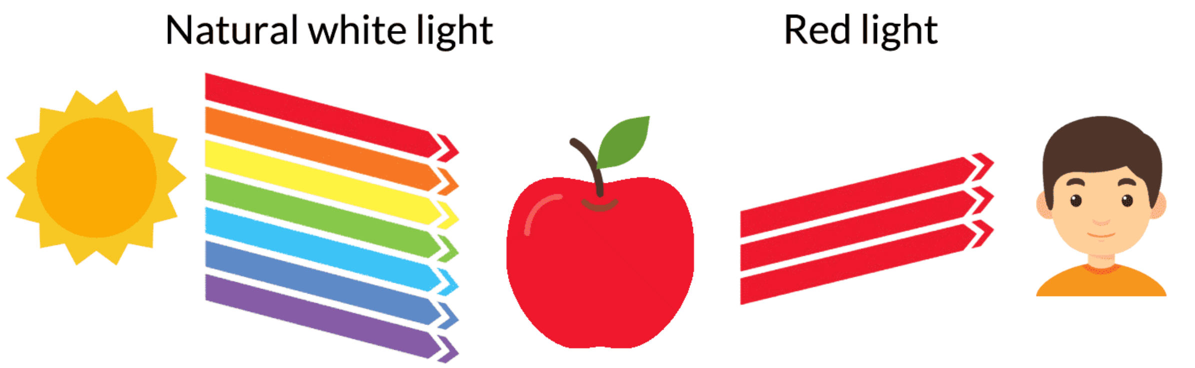
The most obvious difference is the generally lower level of relative power compared to daylight - except for a few spikes. All wavelengths (the full spectrum) are again present but only certain wavelengths (the spikes) are s

trongly present. These spikes indicate which parts of the color spectrum will be emphasized in the rendering of color for objects illuminated by the light source. This lamp has a 2700K color temperature and a CRI of 82. It produces a light that is perceived as “warmer” than daylight (2700K vs. 5000K). Its ability to render color across the spectrum is not bad, but certainly much worse than daylight.

How does color works?

Light sources can be divided into either artificial or natural light sources. In most situations, we are concerned about the color quality of artificial forms of lighting, such as LED and fluorescent lamps. This is compared to daylight or sunlight - a natural light source.

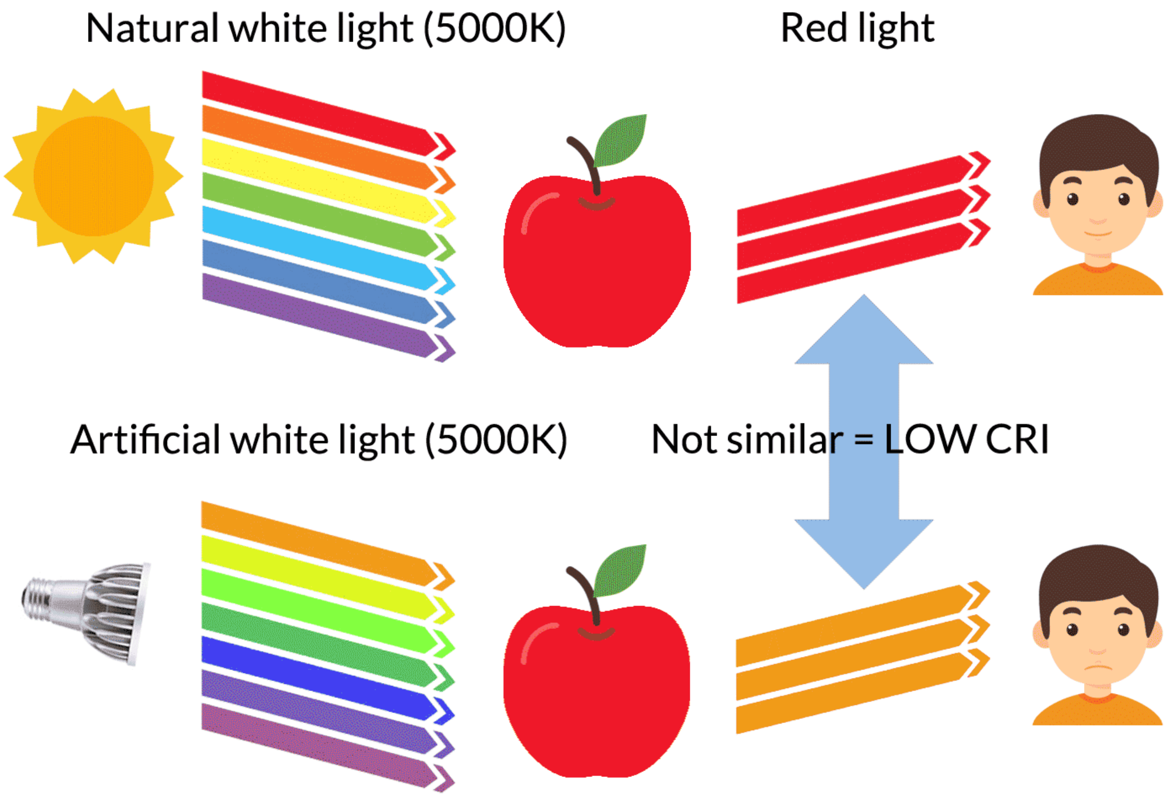
Natural light, such as sunlight, combines all the colors of the visible spectrum. The color of sunlight itself is white, but the colors determine the color of an object under the sun that it reflects.



A red apple, for example, appears red because it absorbs all colors of the spectrum except red, which it reflects.

When we use an artificial light source such as an LED lamp, we attempt to “reproduce” the colors of natural daylight such that objects appear the same as they do under natural sunlight.

Sometimes, the reproduced color will appear quite similar, other times quite different. It is this similarity that CRI measures.



Our example above shows that our artificial light source (an LED lamp with 5000K CCT) does not reproduce the same redness in a red apple as natural daylight (also 5000K CCT).

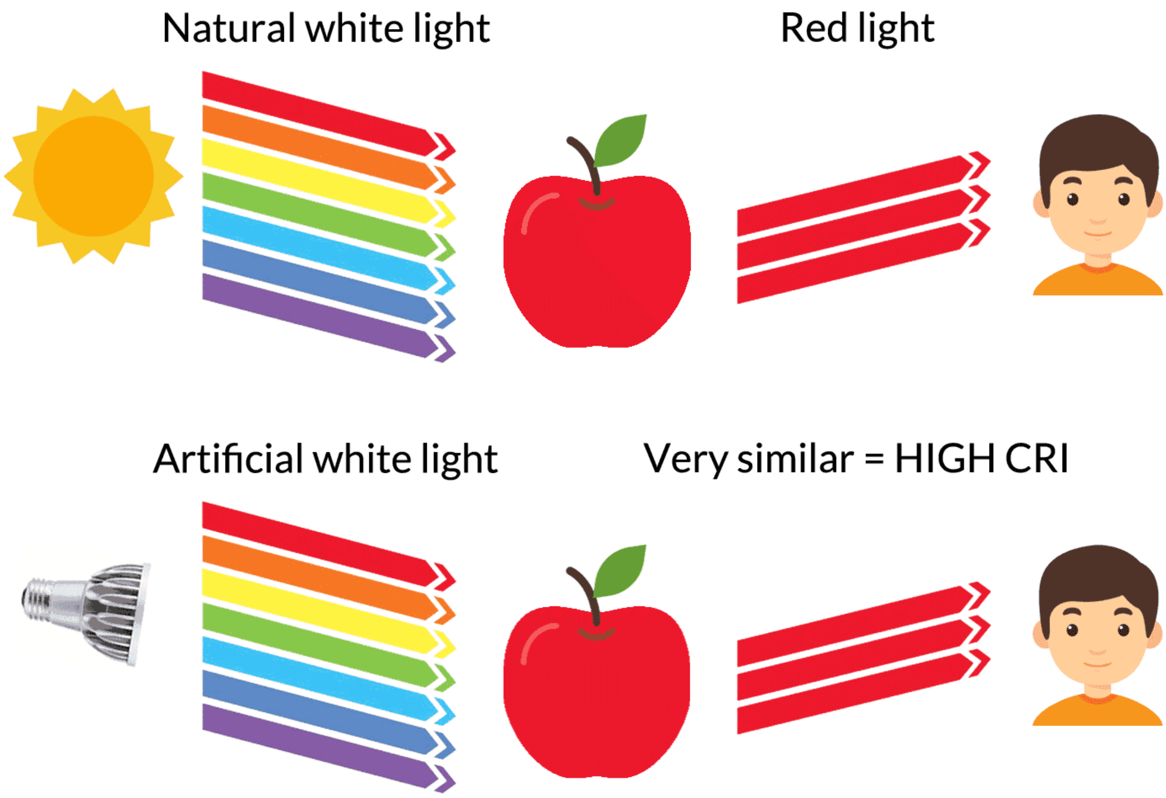
But notice that the LED lamp and natural daylight have the same 5000K color. This means that the color of light is the same, but the objects still appear different. How could this be?

If you look at our graphic above, you will see that our LED lamp has a different spectral composition than natural daylight, even though it is the same 5000K white color.

In particular, our LED lamp is lacking in red. When this light bounces off the red apple, there is no red light to reflect.

As a result, the red apple no longer has the same vibrant red appearance that it had under natural daylight.

CRI attempts to characterize this phenomenon by measuring the general accuracy of various objects' colors when illuminated under a light source.



CRI is invisible until you shine it on an object

As mentioned above, the same light color can have a different spectral composition.
Therefore, you cannot judge a light source' s CRI by simply looking at the color of the light. It will only become evident when you shine the light onto various objects with different colors.

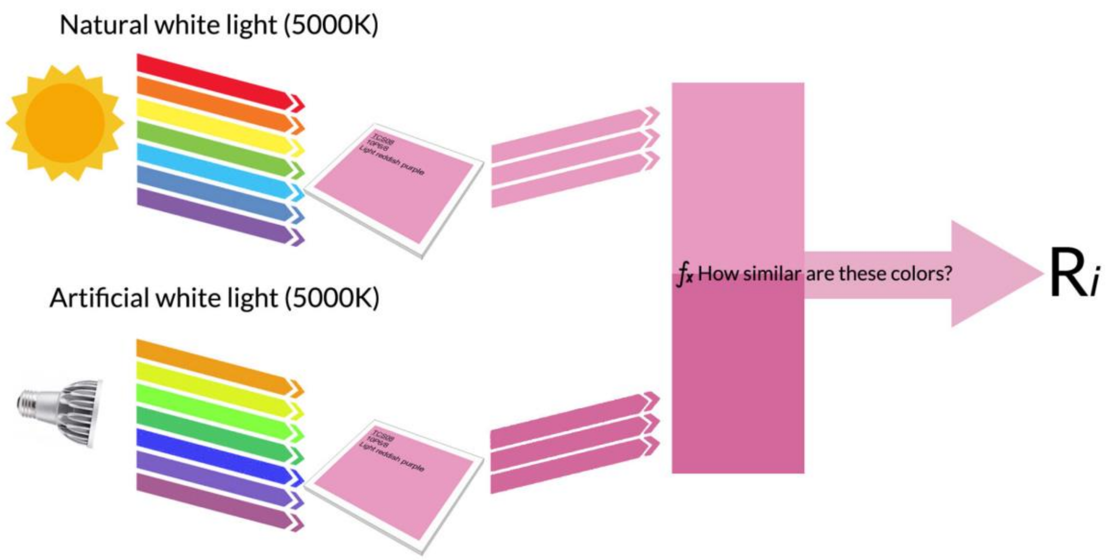
How is CRI measured?

CRI is measured using the industry standard method developed by the CIE. This involves the comparison of a test source' s color rendering to a reference source known as a black body radiator with a perfect CRI score of 100. For this testing, there are fifteen primary reference samples used to calculate the general CRI rating. The sample selected for the reference source is dependent on the color temperature of the light being tested. The ColorChecker chart, established by CIE (1999), categorizes these reference sources and organizes them numerically starting with TCS01 and ending with TCS15. Th

e closer the source being tested matches with the perfect reference source, the higher it will rank in CRI.

TCS01 7.5R6/4 Light grayish red	TCS02 5Y6/4 Dark grayish yellow	TCS03 5GY6/8 Strong yellow green	TCS04 2.5G6/6 Moderate yellowish green	TCS05 10BG6/4 Light bluish green
TCS06 5PB6/8 Light blue	TCS07 2.5P6/8 Light violet	TCS08 10P6/8 Light reddish purple	TCS09 4.5R4/13 Strong red	TCS10 5Y8/10 Strong yellow
TCS11 4.5G5/8 Strong green	TCS12 3PB3/11 Strong blue	TCS13 5YR8/4 Light yellowish pink	TCS14 5GY4/4 Moderate olive green	(TCS15) 1YR6/4 Asian skin

We compare the reflected colors and formulaically determine each color swatch’s “R” score.



The R value for a particular color indicates the ability of a light source to faithfully render that particular color. Therefore, to characterize the overall color rendering capability of a light source across a variety of colors, the CRI formula takes an average of the R values.

Ra is the average value of R1 through R8.

AvgR is the average value of R1 through R15.

Special value: R9

Ra is the average value of R1–R8; other values from R9 to R15 are not used in the calculation of Ra, including R9 "saturated red", R13 "skin color (light)", and R15 "skin color (medium)", which are all difficult colors to reproduce faithfully. R9 is a vital index in high-CRI lighting, as many applications require red lights, such as film and video lighting, medical lighting, art lighting, etc. However, in the general CRI (Ra) calculation, R9 is not included.

R9 is one of the numbers of Ri that refers to test color samples (TCS), which is one score in extended CRI. It is the number rates the light source's color revealing ability towards TCS 09. And it describes the specific capacity of light to reproduce the red color of objects accurately. Many light manufacturers or retailers do not point out the score of R9. At the same time, it is a solid value to evaluate the color rendition performance for film and video lighting and any applications that need a high CRI value. So, generally, it is regarded as a supplement to the color rendering index when evaluating a high-CRI light source.

R9 value, TCS 09, or in other words, the red color is the key color for many lighting applications, such as film and video lighting, textile printing, image printing, skin tone, medical lighting, and so on. Besides, many other objects are not in red color, but actually consist of different colors, including red color. For instance, the skin tone is impacted by the blood under the skin, which means that the skin tone also includes red color, although it looks much like close to white or light yellow. So, if the R9 value is not good enough, the skin tone under this light will be more paleness or even greenish in your eyes or cameras.

What about non-daylight color temperatures?

For simplicity, we've assumed a 5000K color temperature for our examples above and compared it to a 5000K natural daylight spectrum for CRI calculations.

But what if we have a 3000K LED lamp and want to measure its CRI?

The CRI standard dictates that color temperatures 5000K and greater use a daylight spectrum, but for color temperatures less than 5000K, use the Planckian radiation spectrum.

Planckian radiation is essentially any light source that creates light by generating heat. This includes incandescent and halogen light sources.

So when we measure the CRI of a 3000K LED lamp, it is being judged against a “natural” light source with the same spectrum as a 3000K halogen spotlight.

(That’s right - despite the awful energy efficiency of halogen and incandescent bulbs, they produce a full, natural and excellent light spectrum).

The importance of CRI

It should be clear now that CRI is a vital measurement for determining the performance of artificial light and is a crucial purchasing consideration in today’s lighting market. Building managers, decision-makers, and purchasers have recognized the essential benefits of using lights with higher CRI ratings. This includes an improvement in workplace safety and the productivity and efficiency of a commercial environment. These benefits are most noticeable, with lights having a CRI of 80 or above, suitable for general commercial and industrial purposes.

The most readily apparent benefit of lights with higher CRI ratings is the improvement in safety due to increased visibility. Lights with lower CRI ratings, such as sodium lamps and fluorescent lights, do not accurately show true colors, making distinguishing between colors difficult. This can affect the ability to read or notice warning labels, safety zoning, or other crucial safety-related information such as bright colors to draw attention to risks and danger. Improvements in visibility due to a higher CRI light source such as LEDs reduce these risks and the number of accidents, mistakes, and related issues.

Productivity is another benefit of higher CRI lighting, often overlooked on paper. A workplace illuminated with high CRI lighting produces a far more pleasant environment for workers and employees. Higher CRI ratings reduce stress, headaches, tension, depression, and eye strain and improve overall mood, which boosts productivity. This improvement is especially notable over

time due to its direct impact on a company' s bottom line and profitabilit y.

In the retail world, lighting with a high CRI has the additional benefit of improving sales performance. As mentioned previously, customers shopping in retail stores prefer high CRI lighting for the same reasons as employees an d workers. There is such a preference for this that retail locations that h ave switched to high CRI lighting have seen significant improvements in sal es numbers afterward. This is due to a more pleasurable shopping experience and the improved illumination of products, which increases their appeal.

What are common CRI values and what is acceptable?

80 CRI (Ra) is the general baseline for acceptable color rendering for most indoor and commercial lighting applications.

For applications where color appearance is essential for the work being don e inside or can contribute to improved aesthetics, 90 CRI (Ra) and above ca n be a good starting point. Lights in this CRI range are generally consider ed high CRI lights.

For professional reasons, types of applications where 90 CRI (Ra) might be needed include hospitals, textile factories, printing facilities, or paint shops.

Areas where improved aesthetics could be necessary, include high-end hotels and retail stores, residences, and photography studios.

When comparing lighting products with CRI values above 90, it can be benefi cial to compare the individual R values that make up the CRI score, particu larly CRI R9.

Conclusion

In conclusion, the Color Rendering Index (CRI) is a measure of how well a l ight source can render colors compared to a reference light source. CRI is an important factor to consider when choosing lighting for various applicat ions, especially in environments where color accuracy is critical, such as in art galleries, museums, and hospitals. A higher CRI value generally indi cates better color rendering performance. However, it is important to note

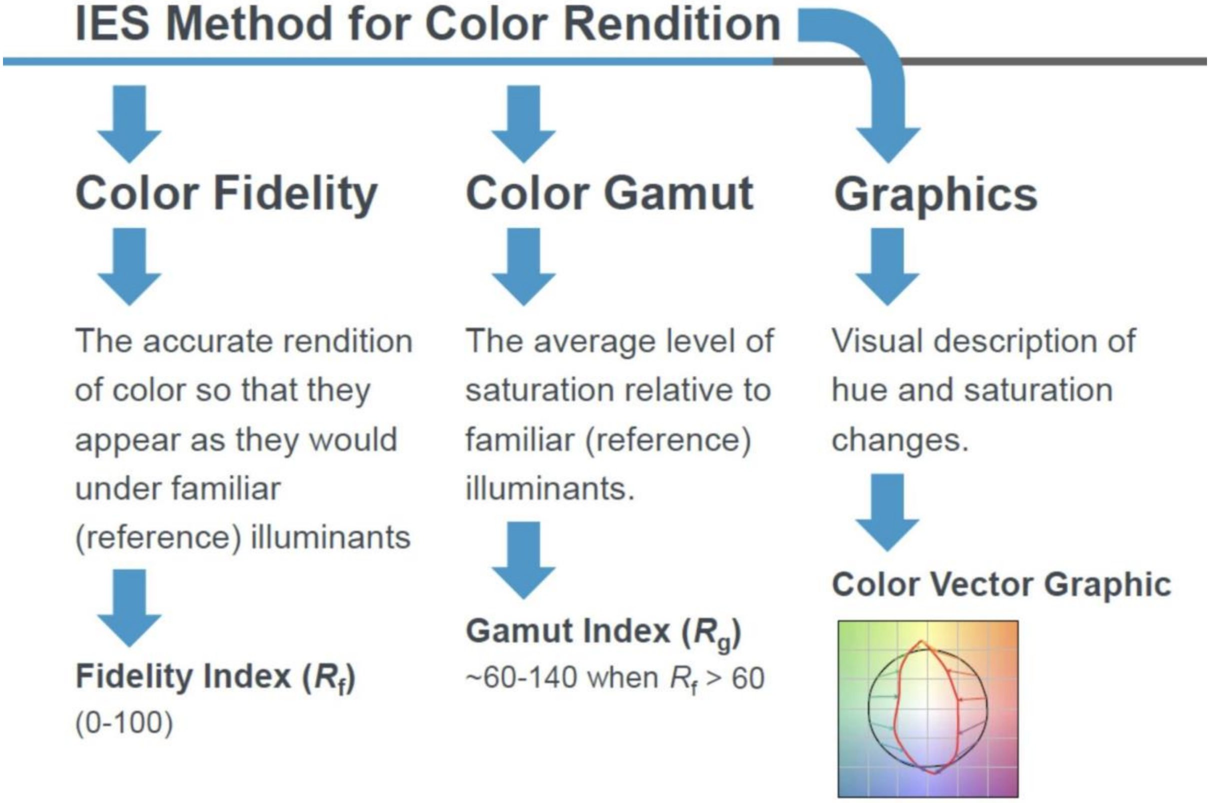
that CRI is not the only factor that affects color perception, and other factors such as color temperature and illuminance should also be considered. By understanding CRI and its importance, consumers and businesses can make informed decisions when selecting lighting that best suits their needs.

TM-30-15: A New Method for Measuring Color Rendition

Most in the lighting world are aware of CRI, also known as Color Rendering Index. It can best be described as the quantitative measure of the ability of a given light source to reveal the colors of various objects faithfully in comparison with an ideal or natural light source. The higher the CRI value of a light source, the more accurate the color appearance of a given object.

CIE Ra's ability to predict color appearance has been criticized in favor of measures based on color appearance models, such as CIECAM02 and the CIE metamerism index for daylight simulators. CRI is not a good indicator for use in the visual assessment of light sources, especially for sources below 5000 kelvin (K). New standards, such as the IES TM-30, resolve these issues and have begun replacing the usage of CRI among professional lighting designers. However, CRI is still typical among household lighting products.

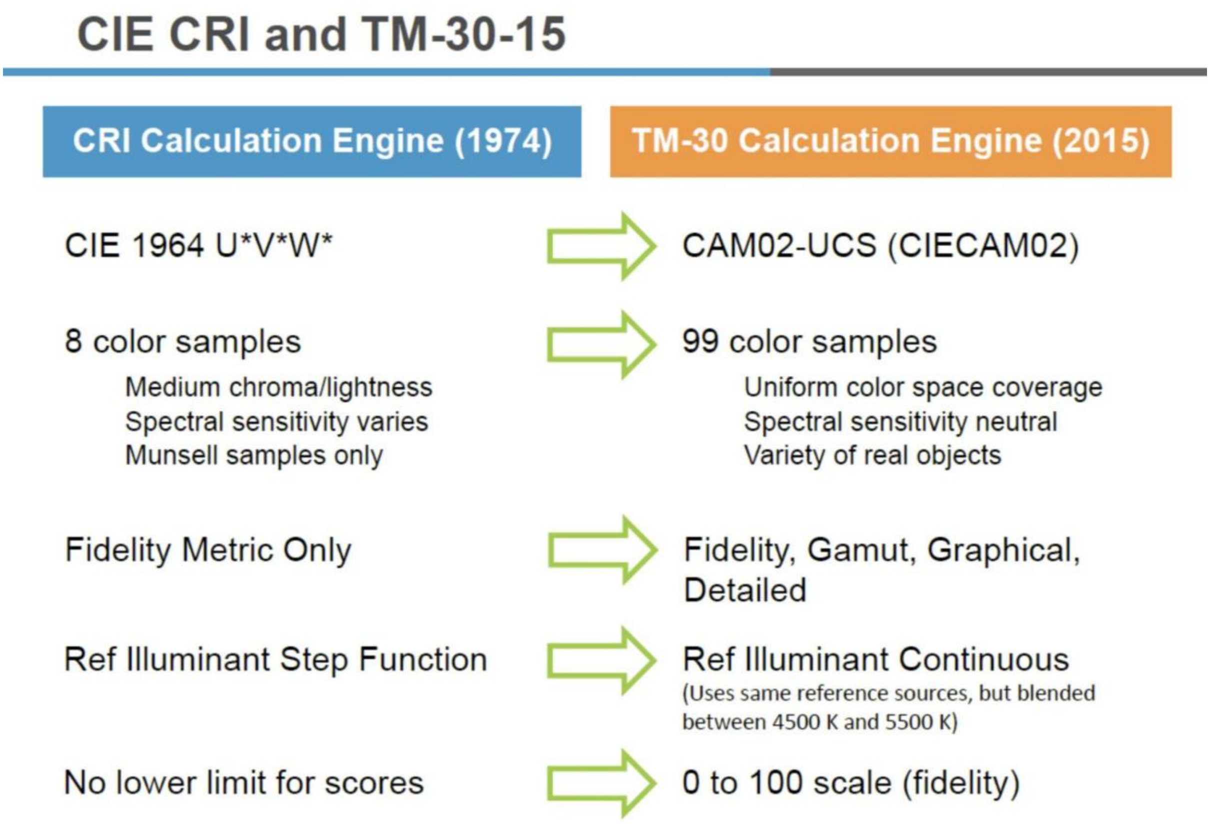
TM30-15 Contains 3 Main Components



- Rf: Analogous to CIE Ra (CRI). Characterizes the average color shift of the 99 CES to characterize the overall level of similarity between the test source and reference illuminant. Values range from 0 to 100.
- Rg: Compares the area enclosed by the average chromaticity coordinates in each of 16 hue bins to characterize the average saturation level of the test source compared to the reference illuminant. A neutral score is 100, with values greater than 100 indicating an increase in saturation and values less than 100 indicating a decrease in saturation. The range in values grows as fidelity decreases.
- A graphical representation of Rg to visually represent which colors are washed out or more vivid due to the light source. It contains Color Vector Graphic, Color Saturation Graphic.
  Color Vector Graphic: Provides a visual representation of hue and saturation changes based on the average rendering in each hue bin, relative to the reference. The graphic provides a quick understanding of how different hues are rendered in different ways.
  Color Saturation Graphic: Provides a simplified visual representation

of only saturation changes based on the average performance in each hue bin.

CRI VS TM-30-15



	CIE 13.3-1995 (CRI)	IES TM-30-15
Year of Issuance	1965, 1974 (Revision), 1995	2015
Color Space	CIE 1964 UVW*	CAM02-UCS (CIECAM02)
Number of Color Samples	8 general (for Ra) plus 6 special (for Ris)	99
Color Volume Coverage	Limited	Full and equal

Saturated Samples	No	Yes
Sample Types	Munsell samples only (limited pigments)	Variety of real objects
Sample Spectral Uniformity	No	Yes
Reference Illuminants	Blackbody radiation, CIE D series	Blackbody radiation, CIE D series
Reference Transition	Sharp at 5000 K	Blended between 4500 K and 5500 K
Output Measures	General index, Ra (fidelity) 6 special indices, Ri (fidelity)	Fidelity Index, Rf Gamut Index, Rg Color Vector/Saturation Graphics 16 hue-based fidelity indices 16 hue-based chroma indices 1 skin-specific fidelity index 99 individual fidelity values
Score Ranges	Max 100 with no lower limit, variable scaling	0 to 100, consistent scaling

Why is TM30-15 important?

- CRI can be found on lamps everywhere today and is not going away right now. The IES is still waiting for feedback and will most likely adjust to TM30-15 before replacing CRI.
- TM30-15 will most likely be used sporadically, especially in applications where color rendering is a prime concern (specifiers, retail shops, etc.).
- Related to TM30-15, CRI can be cheated, as it only compares 9 to the 99 colors TM30-15 corresponds. So if you engineer your product’s out

put to those 9 colors, you can inflate your score without improving the quality of the light source.

Specifiers

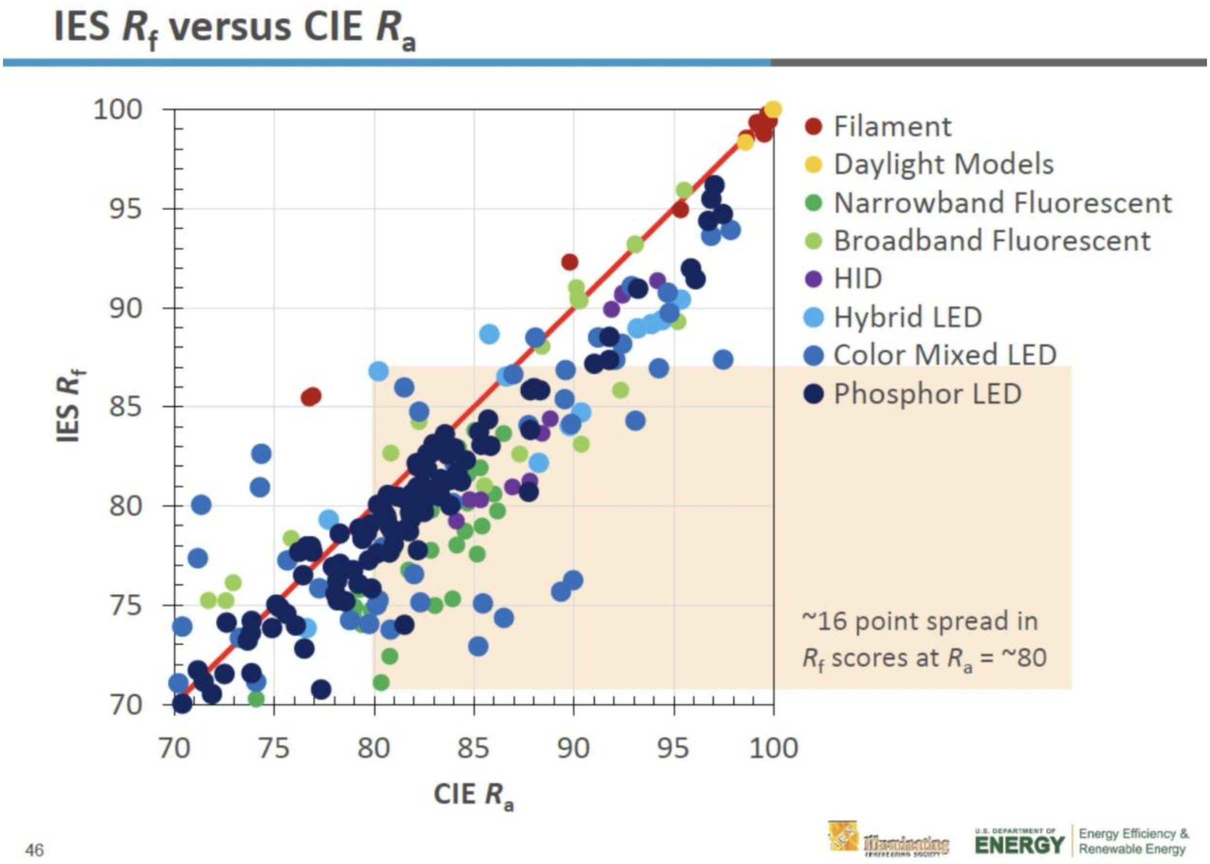
- TM-30-15 is an approved method. Use it and provide feedback to help it reach maturity.
- Choosing a “better” light source may be more challenging but also more rewarding.

Below are some visuals that detail the changes as you alter the various metrics listed above, such as Rf, Rg, and CRI, and comparisons of color vector graphs.

(Theoretical)



Original	**Desaturated**	**Red-Enhanced**
CRI = 95	CRI = 80	CRI = 80
R_f = 93	R_f = 78	R_f = 78
R_g = 100	R_g = 90	R_g = 110



Additional Resources

LEDYi is a professional LED light strip manufacturer, we produce high quality LED light strips and LED Neon Flex. You and check the below resources to understand TM-30-15 better.

Evaluating Color Rendition Using IES TM-30-15

Understanding and Applying TM-30-15

What Is LED Binning?

When manufacturing LED lighting, LED binning is essential. This process determines the quality and performance of LED lights. But what exactly is LED binning, and how does it affect the LED lights you use daily?

LED binning is a method used to ensure the uniformity and grading of LED lighting products. It involves examining individual LED chips for their brightness, temperature, and other factors. And thus organize them into groups with similar features.

In this article, I will explain the concept of LED binning. You will also learn about the different types of binning. And how they impact the performance and efficiency of LED lights. So, let’s get started-

What is LED Binning?

LED binning is sorting and grouping LEDs based on their performance characteristics, such as color and brightness. Moreover, this ensures that each LED in a batch meets specific standards. And so you can use it in particular applications.

This process helps manufacturers and customers ensure that the LEDs they receive meet their requirements. Additionally, LED binning allows them to improve their production efficiency and quality.

Benefits of LED Binning

LED binning is essential to keep up the quality of LED lighting. And so it comes with many benefits, these are as follows-

Improved Color Consistency

LED binning allows manufacturers to sort LEDs by color and brightness. This ensures that all LEDs in a particular bin have similar properties. Thus, it improves the consistency of the final product.

Increased Efficiency

Manufacturers sort LEDs into bins based on their performance. For example, all its chips are tested to have equal power or brightness while manufacturing LED strips. If all the chips are not equally efficient, the output won’t be productive. All fixtures are tested in the LED binning process to m

aintain quality. And this increases the overall efficiency of the final product.

Better Quality Control

All fixture features are tested in LED binning, and non-standard components are eliminated. It also allows manufacturers to identify and address issues with their production process. Thus, LED binning improves the overall quality of the final product.

Types Of LED Binning

The sorting of LEDs is done based on a variety of considerations. Depending on this factor, you can group LED binning into Four main types. These are as follows-

Color Binning

Color binning is the process of sorting LEDs by their color characteristics. This ensures that all LEDs in a batch have the same color output and intensity. You can do this using advanced measuring equipment or visual inspection. Also, color binning helps guarantee consistent lighting performance.

- **Importance Of Color Binning**

It ensures the LEDs in a particular product have the same color temperature (CCT). Also, Color binning provides an accurate color rendering index (CRI). This makes the light of the LEDs consistent across all units. And the colors of objects are accurately represented.

- **Standards for Color Binning**

LED color binning is based on the CIE 1931 Chromaticity Diagram (from the International Commission on Illumination). This diagram has a series of quadrilaterals that identifies differences in light spectrums.

This CIE standard divides LED color temperatures into four categories. These are;

Type Of Color	Color Temperature (CCT)
Warm	2700K to 3500K
Neutral	3500K to 5000K
Cool	5000K to 7000K
Ultra-cool	7000K to 10000K

The Color Rendering Index (CRI) and the Color Quality Scale (CQS) are the other standards used for LED color binning. The CRI measures how accurately a light source renders colors in natural sunlight. At the same time, the CQS calculates how accurately a light source displays subtle color differences. A good-quality LED must have a CRI of at least 80, whereas a CQS of at least 70.

- **Methods for Achieving Consistent Color Binning**

There are a few methods that can achieve consistent color binning in LEDs.

Spectrophotometry: This method involves measuring the spectral characteristics of each LED using a spectrophotometer. The data collected can then sort the LEDs into different bins. It is based on their color and brightness properties.

Colorimeter: A colorimeter is a device that measures the color of an LED by analyzing the light it emits. This information can sort the LEDs into different bins based on color properties.

Visual Inspection: This method involves visually inspecting each LED. It determines its color and brightness properties. Besides, this method can be less precise than the other methods. It is often used as a quick and easy way to sort LEDs into different bins.

Automated Binning: It is a process where LEDs are sorted into different bins using machine vision and robotics. This method is fast and efficient. How

ever, it requires a high degree of precision. It also needs accuracy to produce consistent results.

Luminous Flux Binning

Luminous Flux Binning categorizes LEDs into different bins based on their light output. The procedure entails counting each LED’s light output. After that, group them into bins based on brightness.

- **Importance of Luminous Flux Binning**

Luminous flux binning includes sorting LEDs based on the light’s brightness or output. Thus, it ensures all the fixtures in a batch glow equally bright. Also, it will produce consistent and uniform lighting. Besides, luminous flux binning eliminates the chances of using high-powered LEDs more than the requirements. And sorts the LEDs based on their brightness and efficiency. Thus, it reduces costs and increases profitability.

- **Standards for Luminous Flux Binning**

The luminous flux measurement determines the LEDs’ efficiency and performance. For each batch of LEDs, manufacturers set standards for acceptable luminous flux levels. These standards vary depending on the manufacturer. But generally, they include categories such as “A,” “B-grade, and “C.” “A” is the highest quality, and “C” is the lowest. For example, an A-grade LED might be expected to have a light output more splendid than or equal to 90 lumens per watt (lm/W). Besides, a C-grade LED might be expected to have less than 70 lm/W.

- **Methods for Achieving Consistent Luminous Flux Binning**

Several methods can achieve consistent luminous flux binning:

Statistical Binning: This method involves measuring the luminous flux of a large sample of LEDs. It divides them into groups based on their flux levels. This method is the most accurate and is commonly used in the industry.

Spectrophotometer Binning: This method involves using a spectrophotometer to measure the flux of each LED. However, this process of sorting is less accurate than statistical binning. Despite that, it is still widely used.

Visual Binning: In this method brightness of the LEDs is inspected visually. This method is the least accurate. Though, it is still commonly used in some applications.

Binning by Correlation: This method is a combination of statistical binning and spectrophotometer binning. The correlation between the two ways ensures binning consistency.

Voltage Binning

Voltage binning classifies LED components based on their voltage levels. This is confirms that you can use them on the same circuit without risk of failure. The higher the voltage, the better the quality and performance of the LED component.

- **Importance of Voltage Binning**

Voltage binning tells whether the LEDs safety for use. It also ensures that it meets the desired performance standards. The voltage binning involves sorting LEDs into different "bins" according to their forward voltage. So you can identify LEDs with a higher or lower forward voltage than expected. It also allows you to sort out light fixtures that do not fulfill the standards. Thus, it reduces errors and improves the quality of the product.

- **Standards for Voltage Binning**

Based on forward voltage, LED bins are generally divided into four categories: high-voltage, low-voltage, standard-voltage, and ultra-low-voltage.

Forward Voltage Standard	Range
High-Voltage	4.0 - 4.2 V
Standard-voltage	3.3 - 3.6 V

Low-voltage	2.7 - 3.2 V
Ultra-low-voltage	2.7 V

- **Methods for Achieving Consistent Voltage Binning**

Multi-sorting Method: This process involves sorting LEDs using multiple criteria. Such as voltage, current, and luminous flux. This ensures that the LEDs in each bin have a consistent voltage. Other characteristics will also result in compatible voltage binning.

Reverse Bias Method: This method involves applying a reverse bias voltage to the LED. And measuring the current flowing through it. LEDs with similar reverse bias current characteristics are grouped into the same bin. This ensures consistent voltage binning.

Temperature-Controlled Binning: This technique involves grouping the LED's considering voltage characteristics at specific temperatures. Such sorting ensures consistent voltage binning across different temperature ranges.

Machine Learning-based Binning: This method uses machine learning algorithms. It groups LEDs into bins based on their voltage characteristics. Also, this ensures consistent voltage binning. It can also identify slight deviations in voltage that other methods may miss.

Temperature Binning

Temperature binning is sorting LED chips by their most operating temperature. Usually, LED binning is done at 25° C. But nowadays, a new system is implemented called hot binning. In this process, binning is conducted at a higher temperature (usually 85° C) than the traditional 25° C standard. Such binning improves the chromaticity selection and the consistency of the LEDs. However, the hot binning temperature varies with the LED fixture's operating temperature.

- **Importance of Temperature Binning**

The performance of an LED can vary depending on the operating temperature. Some LEDs have to survive in the cold icing environment, while others are r

equired to operate at higher temperatures. That is why temperature binning is essential to ensure the LED bins can conduct in the desired atmosphere. And so, hot binning is an excellent way to improve the temperature resistance of the LEDs. In this process, you must use a higher temperature for LED binning to ensure quality performance under unfavorable conditions.

- **Standards for Temperature Binning**

In LED binning, operating temperature is a significant factor that directly or indirectly affects the fixture's lifespan. That is why temperature is considered while LED binning. Here is a chart that states the light's operating temperature in different situations:

Different Lighting Cases	Operating temperature
Outdoor Luminaires	60° to 65° C
Freezer Cases	20° to 25° C
Downlights in Insulated Ceilings/Retrofit bulb	often over 100° C

So, while planning the LED binning process, consider the operating temperature. And calculate at which temperature you should test the LED chips to ensure their maximum performance.

- **Methods for Achieving Consistent Temperature Binning**

Calibration of Temperature Sensors: Temperature sensors need to calibrate. It ensures that they are reading at the correct temperature. The manufacturer can compare the sensor readings to a known temperature source, such as a thermocouple, and adjust the output.

Temperature Monitoring Software: Temperature monitoring software can track temperature readings and make adjustments as necessary. This software can also generate reports. They also alert the user when temperature readings are out of range.

Temperature Compensation Techniques: Temperature compensation techniques can correct temperature variations. These variations happen due to changes i

n ambient temperature. Besides, a thermistor can measure the ambient temperature. It can also adjust the power to the LEDs accordingly.

Thermal Management: Proper thermal management will help ensure consistent temperature binning. A manufacturer can do this by using heat sinks. Or they can use other cooling methods to dissipate heat generated by the LEDs.

What is Macadam Ellipse?

Macadam Ellipse is a method used in LED binning to define the color variation of a group of LEDs. It is a graphical representation of the color coordinates (x, y) of a group of LEDs in the CIE 1931 color space. It measures the consistency of color across a group of LEDs. Also it calculates the distance between each LED’s color coordinates. It also figures the center of the ellipse. The smaller the ellipse, the more consistent the color of the LEDs in the group. This method is commonly used in the production of LED lighting products. It ensures that the LEDs are of consistent color and quality.

The Process of LED Binning

There are some essential steps required in LED binning. Let’s explore them below:

Step 1: Sorting LEDs by Voltage and Brightness

First, create an organized system of sorting based on the desired voltage and brightness levels. For example, you might use voltages ranging from 1V to 5V and brightness levels from 0 lumens to 500 lumens. Once your sorting system is in place, begin testing each LED individually. To do this, use a multimeter or other testing device to measure the current voltage. Also, measure the luminosity of each LED. After that, you can then place them into their respective bins.

Step 2: Slicing the Semiconductor into Die

In this step, you must slice the semiconductor with a diamond-tipped saw. Next, sort the die by color and brightness into bins. The sorting process is

done with automated equipment. It can measure the light output of each die and categorize it according to the desired standard.

Step 3: Wire Bonds and Electrical Connections

Wire bonds create a tight electrical connection by wrapping the metal strand around cables. This process ensures that the connection is secure and reliable. Once the wire bonds are complete, you must attach the LED components to their power source using solder or crimp connectors. Now, your LEDs are ready to sort.

Step 4: LED Binning

After ensuring proper wire bonds, sort the LEDs according to specific criteria. Consider the size, color, voltage, and other factors and group them accordingly. First, measure the light output of the LEDs using a lux meter. This ensures that the brightness level meets the desired specifications. Then, they use a spectrometer to measure each batch' s color accuracy and consistency. Also, check the size of the chip and its voltage. In this process, automated machinery is of great help. Besides, these can also be done manually but won' t be reliable.

Step 5: LED Quality Control

After LED binning, it' s time for a quality test. Here the QC team looks for potential defects, durability, and other tests. And thus, verify that each batch meets its quality standards with these tests.

Thus following these simple steps, you can successfully carry out the LED binning process.

What is the Difference Between Color Binning and Flux Binning?

Color binning and flux binning are two methods. They sort and classify lights based on color and brightness.

Color binning involves sorting and classifying based on light' s coloring properties. It can be the range of wavelengths of light that they are most s

ensitive to. This is typically done by measuring the device’s spectral response. And then group them into different “bins” based on their characteristics.

Flux binning, on the other hand, involves sorting LEDs based on lumen ratings. In this process, LEDs are grouped by their brightness. The higher the lumen rating, the brighter the light.

To sum up, color binding deals with the coloring properties of light. Meanwhile, flux binding considers the brightness of the light for LED sorting.

Factors To Consider While LED Binning

Several factors can affect the success of LED binning:

Bin Criteria

In LED binning, you should consider the following bin criteria:

- **Luminous Flux:** The light emitted by the LED is measured in lumens. LEDs are grouped into bins based on their luminous flux. Higher bins have higher flux levels.

- **Color Temperature:** The color of light emitted by the LED, measured in Kelvins. LEDs are grouped into bins based on their color temperature (CCT ratings). Higher CCT bins have cooler (bluer) colors, and lower ones have warmer (redder) colors.

- **Forward Voltage:** The voltage required to drive the LED, measured in volts. LEDs are grouped into bins based on their forward voltage. Higher bins have higher voltage requirements.

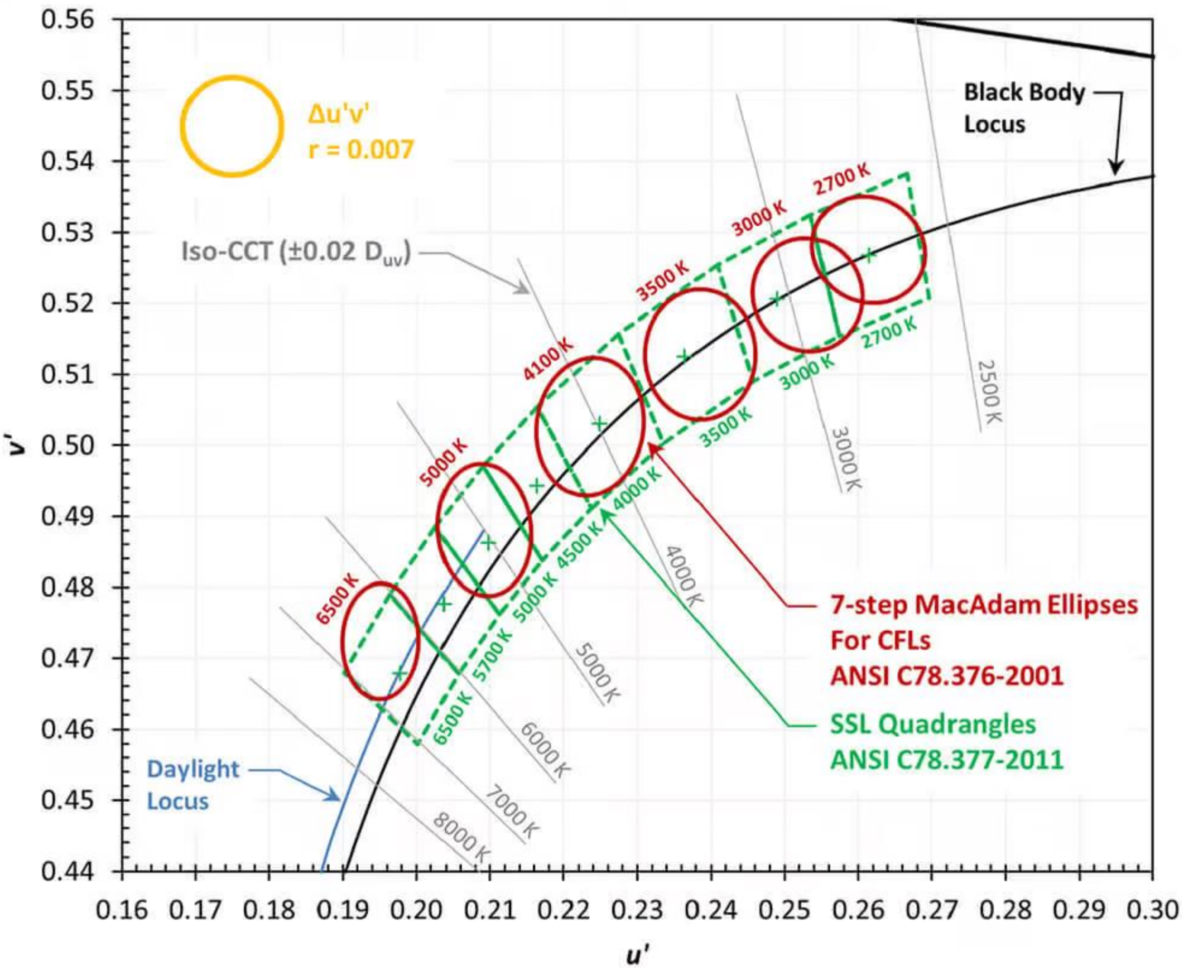
Technology Considerations

Technology considerations for LED binning include:

- **Measuring Equipment:** Accurate measuring equipment is necessary to test. It is also vital to sort the LEDs based on their performance chara

cteristics.

- **Binning Algorithm:** The algorithm to sort and group the LEDs should be consistent and repeatable.
- **Temperature:** This can significantly impact the performance of LEDs. So, measure and bin the LEDs at a consistent temperature.
- **Binning Standards:** Different applications may require different binning standards. Understand and adhere to the appropriate binning standards for a given application.
- **Automation:** Automated binning systems can increase efficiency and reduce human error.
- **Traceability:** It is important to be able to trace the binning process. Also, trace the characteristics of each binned LED.



Industry Standards for LED Binning

Industry standards for LED binning vary depending on the applications. Some common standards have:

- **ANSI C78.377-2017:** The American National Standards Institute (ANSI) developed these criteria for LED lamps and luminaires. It defines the color and chromatic specifications for general lighting services.

- **IES LM-80-08:** The Illuminating Engineering Society (IES) developed this standard. They give guidelines for measuring and reporting the lumen maintenance of LED light sources.

- **JEDEC JS709A:** The Joint Electron Device Engineering Council (JEDEC) developed this standard. They define the binning and sorting needs for high-brightness LEDs.

- **CIE S025/E:2017:** The International Commission on Illumination (CIE) set this standard. They provide guidelines for the color coordinates of LED light sources.

- **IEC 60081:** This standard is for fluorescent lamps. It defines 5-step MacAdam ellipses for six nominal CCTs.

Environmental Regulations for LED Binning

Environmental regulations for LED binning vary by region and application. But some standard conditions include;

- **Compliance with RoHS (Restriction of Hazardous Substances) Directive:** This EU directive bans using certain hazardous substances in electronic products. They include lead, cadmium, and mercury. So, while LED binning, you must consider this fact.

- **Energy Efficiency Standards:** Many countries have energy efficiency criteria for lighting products, including LED products. These standards may specify minor energy efficiency levels. Also, it can be the maximum power consumption level for other types of products.

- **Safety standards**: LED products must follow relevant safety standards. Such as UL and CE. This ensures that they do not pose a fire or electrical hazard.

These general guidelines and regulations may vary in different countries and regions. Manufacturers should be aware of the rules while LED binning.

Thermal Effects of LED Binning

The thermal effect on LED is inversely proportional to the forward voltage, VF. When the temperature increases, the forward voltage drops, increasing the current flow in the LEDs. And excessive current flow can negatively affect the performance of the fixture.

Another thermal effect of LED binning is the impact on the luminous flux of the LED. The luminous flux of an LED is affected by the temperature of the LED. As the temperature increases, the luminous flux decreases. And thus, it directly affects the brightness of the lighting.

In addition, thermal management can also affect the overall lifespan of an LED. As an LED's temperature increases, the LED's rate of deterioration also increases. It leads to a shorter lifespan. Proper thermal management can help to mitigate this effect.

Common Issues or Challenges with LED Binning

While LED binning, you may face some common issues, which include:

- **Color Variations:** In the LED binning process, the sorting and grouping of LEDs are done, keeping the coloring feature of all bins constant. Yet, some LEDs may have slight variations in color. They can affect the appearance of a lighting system.

- **Lumen Depreciation:** LED binning also sorts LEDs by their luminous flux and brightness. Yet, over time, an LED's brightness can decrease, which is known as lumen depreciation. This can cause uneven lighting and affect the performance of the system.

- **Incorrect Binning:** If LEDs are not correctly sorted or grouped during the binning process. It can lead to a mismatch in performance and col

or. This can cause issues with the lighting system.

- **Cost:** Binning LEDs can be a costly process. It requires specialized equipment and skilled personnel. So, this can affect the overall cost of a lighting system.

How to Test a Binned LED?

To test the binned LED, you need to follow these steps:

Step 1: Connect the LED to a Power Source: Attach the LED's positive lead to the power source's positive terminal. Then touching the negative charges to the negative terminal. And thus examine if the LED glows or not.

Step 2: Measure the Voltage and Current: Use a multimeter to measure the voltage across the LED and the current flowing through it.

Step 3:Calculate the Value of the Resistor: Use Ohm's law to calculate the value of the resistor. The formula is R = (Vsource - Vf) / If

Step 4: Compare the Readings with the Specifications: Check the datasheet of the LED to see what the expected voltage and current should be for that binned LED. Compare the readings from the multimeter with the specifications.

Step 5: Observe the Light Output: If the voltage and current readings match the specifications, observe the light output of the LED. If it is not as expected, there might be a problem with the LED.

Step 6: Repeat the Test with Different Power Sources: Repeat the test with different power sources to ensure the LED functions correctly.

Note: Binned LEDs are categorized based on their forward voltage and current. It is essential to test these values to ensure that the LED is functioning correctly.

Tips for Optimizing Your LED Binning Process

- **Clearly define your desired LED binning parameters:** Identify the parameters you wish to use for binning. Such as color temperature, lumin

ous flux, and forward voltage. This will ensure that all LEDs are evaluated against the same criteria.

- **Use a consistent testing methodology:** Use consistent testing methods throughout the binning process. This may include using the same tools and measurement techniques, also, testing conditions for each LED.

- **Use automated binning software:** Automated binning software can streamline the binning process. Also, it can reduce the potential for human error. These programs can automatically sort LEDs into different bins.

- **Keep detailed records:** Keeping detailed records can help troubleshoot any issues that may arise. As well for future reference. This may include information about the testing equipment used. Also, the binning parameters and the results of each test.

- **Regularly review and adjust your binning process:** Reviewing and updating your binning process can ensure you always get the best results. And it will solve the previous problems.

- **Consider the final application:** This will help you identify essential binning parameters. It ensures that you select the best LEDs for the specific application.

Conclusion

In conclusion, LED binning is a sorting process of LEDs. It organizes LEDs based on their optical and electrical characteristics. This process allows manufacturers to confirm that they package LEDs with similar features. And thus, LED binning improves the performance and character of LED-based products. It will continue to play a tremendous role in the development and advancement of LED technology.

Everything You Need To Know About Beam Angle

Be it home or workplace, every space needs adequate lighting to provide utility. And to achieve optimal lighting, several factors have to be kept in the account. These include luminosity, colour temperature, and the interior of the spaces. Besides these, there is another essential factor that you must consider. That is beam angle, and it is the measure of how light spreads from its source. It is one of the easiest metrics to optimize the lighting in different spaces. But one must understand it comprehensively to make a decision based on it.

So, in this guide, we will discuss everything there is to know about Beam Angle. It will help optimize the lighting in your homes and offices. So, let’s get straight to it.

What Exactly Is Beam Angle?

Light is made up of tiny particles known as “photons,” when these photons are emitted, they have a certain trajectory. The angle that this trajectory makes is called the “Beam Angle.” The mechanism by which photons are produced varies in different light sources. Hence, the beam angle of the different lights also varies.

The beam angles are divided into several categories. They range from very narrow to very wide. Lights with broader beam angles spread wide. In contrast, the narrower beams have a lesser spread. Furthermore, the beam angle also impacts light intensity because it depends on the overall spread. A light that spreads more will be less intensive than that that has a narrower spread.

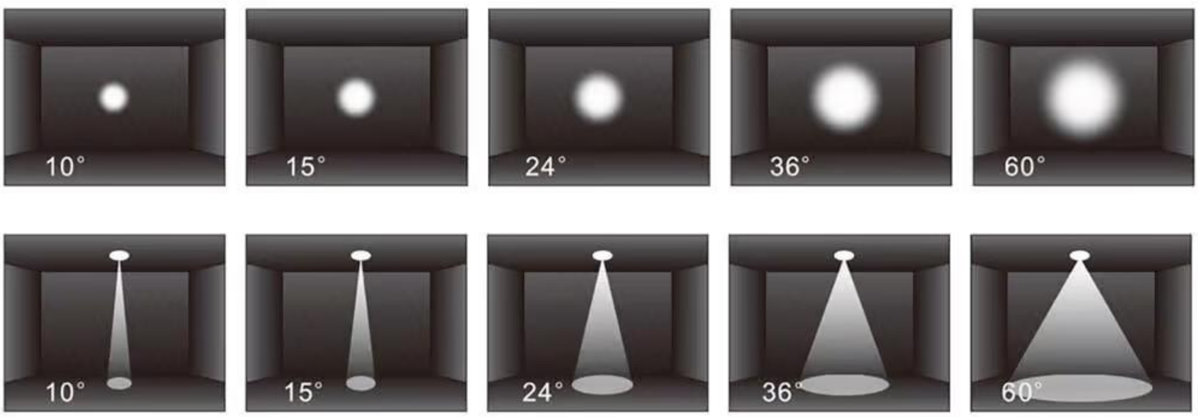
The light required to light up a space depends on its area and the preferred light source. It is expressed in the lumen and describes the intensity of the light. The point is a larger size would require more lumens than a narrower one. Hence, the light source should have a beam angle that spreads narrowly to brighten the entire space.

The following tables tell the light spread based on its beam angle based on NEMA. National Electrical Manufacturer Association, or NEMA, is one of the most credible associations of electrical equipment manufacturing companies.

And the classification of beam angle by NEMA is widely used in the industry.

Beam Angle	Description	NEMA Type
130+	7	Very Wide
100-130	6	Wide
70-100	5	Medium Wide
46-70	4	Medium
29-46	3	Medium Narrow
18-29	2	Narrow
10-18	1	Very Narrow

Most reputed light manufacturers provide information on the beam angle of their products. You can check for it and compare it with the provided table to know the kind of spread it will have.



How Does Beam Angle Affect Lighting Conditions?

Beam angle affects the lighting conditions of space by impacting the spread of the light. For instance, two LED lights produce 600 lumens but have different beam spreads. The one with a broader beam angle would brighten up more area than the narrower one.

However, while the wider beam angle would provide more spread, the light would not have a high intensity. It is because photons spread over a larger area, dividing the intensity in a large area. In contrast, the narrower beam angle would not produce as much spread, but it will be more intense. Again, a narrower beam would concentrate the photons in a more limited region.

Different spaces in homes and offices have varying lighting requirements. For example, some areas require intense light to enhance the utility, while others need a better spread. Therefore, you should select a beam angle based on the utility and the lighting requirement of a particular space.

Role of Beam Angle in Different Types of Lighting

Each area has different lighting requirements, divided into three main categories. These include basic lighting, accent lighting, and decorative lighting.

Basic Lighting

Basic lighting is the most common and widely used in all spaces. You often see such lighting in living rooms, bedrooms, garages, and bathrooms. It strikes a balance between intensity and spread. Typically, the basic lighting covers the entire space with enough intensity to provide decent utility. The beam angle for such lights ranges from 120 to 90 degrees, depending on the size of the area.

Accent Lighting

Accent lighting highlight a particular area in a space. For example, you can use it to brighten up the living room’s seating area or highlight the walls’ colour. Because it does not require a wider spread, you can use light with narrower beam angles. Lights with such a beam angle light up only a se

lected area and provide profound intensity. Typically, you use Medium Narrow or Narrow beam angles for accent lighting.

Decorative Lighting

Decorative lighting, as the name suggests, is used for decoration. For example, you can use them to highlight a decoration piece or install different coloured lights in some parts of the homes. Typically, narrow and very narrow light beams are used for this purpose. These lights do not have to brighten up a large space but a narrow region. And the narrower angles provide exactly that while offering more intensity.



Applications of Different Beam Angles

Since different beam angles produce different light styles, their applications also vary. So let’ s take a look at them.

Narrow Beam

A narrow beam angle covers a smaller area but provides more intense light. Such light angles work best for case closets and small kitchens and highlig

ht certain houses' areas. In commercial spaces, you should prefer it for warehouses and accent lighting tables in restaurants. However, while using these lights in the warehouse, remember that you will get little coverage. Hence, you would need multiple lights to get proper lighting.

Medium

A medium angle strikes a balance between intensity and coverage. Hence, these lights work best in living areas in domestic spaces. However, you can prefer them for ambient lighting in clothing stores in commercial spaces.

Wide

Wide angle has a broader spread and is used to light outdoor spaces. For example, you can use it in a home patio space to provide ambient light to a large commercial store.

Very Wide

Such a beam angle aims to spread the light as far as possible. Hence, these are typically used outdoors in floodlights and street lamps.



How To Select The Right Beam Angle?

Now that you know the impact of beam angle on the lighting conditions, you must also know that several factors determine the right beam angles. You must consider the following factor to select the right beam angle for a particular space. Let’s take a look at them:

Type of Building

The first thing that you should take into account is the type of building. You have to be aware of the space’s size, the ceiling’s height, and the required number of fixtures. If a room has a high ceiling and a shorter area, it would need a lesser number of fixtures. Furthermore, the narrower beam for such spaces would work better because not much spread is required.

In contrast, a building with a wider area and a lower ceiling would be better off with a broader beam angle. Selecting a narrow beam angle for such spaces creates less spread which would not be enough to light up the entire area.

Most buildings have ceiling heights of about 7.9 to 8.9 feet. Lights with a wider angle of 60 degrees will work for such structures. However, if the ceiling is higher than 8.9 feet, you would need multiple lights. And it would help if you chose a narrower beam angle to provide adequate lumens.

Number of Lights

The area of different spaces varies, thus the number of lights required to brighten it up. It is also an essential factor that you should consider when selecting a beam angle. If space requires two or more lights, the beam angle for each one would have to be estimated separately.

You would have to devise a lighting plan and assign a portion of the area to each light source. That particular light source should have a beam angle that covers the entire area and provides adequate lumens.

Not all portions of the space need to have the same area. Hence, the requirement for each part can vary. The point is you cannot select an optimal beam angle based on the calculation of a single portion.

Another critical point is that all the light beams in a single space must overlap. Otherwise, there will be areas that receive no light and will be darker.

Different LED Lights

Once you have noted down the lighting requirements of the space, you would have to pick between several LED types. Each of these types offers a different beam angle which you should consider before purchasing them. The beam angle of a LED might vary within its category, but the following table shows general beam angles of different categories.

LED Type	Beam Angle
LED Downlight	30-60
LED High Bay light	60-120
LED Tube Light	120-160
LED Flood Light	120-150
LED Corn Light	180-360
LED Spotlight	15-90
LED Strip Light	120
COB LED Strip Light	180

Right Beam Angles For Different Spaces

Now that we have covered the basics of beam lights, let’s move on to the lighting requirements of different spaces. Generally, we can divide light styles into two categories, domestic and commercial. The two types have different applications; hence, the appropriate beam angles also vary. So, let’s take a look at them.

Residential Buildings

Residential buildings have lower ceilings and square areas than commercial properties. Furthermore, the lighting requirements mostly stay the same for the houses and apartments. Hence, you can use the same beam angle in both spaces. For most domestic spaces, the beam angle of 40-60 degrees would work the best. This angle will cover the entire space area, including a bedroom, kitchen, and bathroom.

However, the living rooms generally have a larger area, so it needs more spread than the other spaces in a house. Hence, it would be best if you chose anything above 60 degrees to light up the living room. The calculation might vary based on the factors discussed in the earlier section.

In addition to covering the significant spaces, specific components such as staircases, closets, and kitchen cabinets also have lighting requirements. Because the light in such areas has to cover a narrower region, a narrower angle of about 25 degrees is ideal for them.



Commercial Buildings

Commercial buildings have several types, and the lighting requirements for each class vary significantly. Hence, we have divided them into the following sub-categories.

Offices

Workspaces like offices need intense lighting in all of their areas to ensure that the space of every employee is well-lit. It is imperative in workplaces where employees spend most of their time on laptops and desktops. Poor lighting conditions around the desk can cause strain on the eyes, which can decrease productivity. Such spaces benefit the best from lights with narrower beam angles to provide more intensity. However, you must install more lights to cover the entire area.

Warehouses

Warehouses typically have higher ceilings than other Commercial spaces. A wider beam angle would not help because light would not reach down because of low intensity. You should use a narrower beam and install multiple lights

to brighten a warehouse. However, the wider beam can also be opted for only when you install the lights into walls instead of ceilings.



Retail Stores

The purpose of lighting in retail stores is not just to provide adequate brightness in the space but also to showcase products. Hence, it requires brighter and more intense light, which narrower beams can achieve. You can use a combination of light beams to provide optimal light in the entire store.

For example, the wider beam can be used in ceilings to cover the whole store. In contrast, you can use very narrow beams, such as 10 degrees in racks, to highlight the products.

Restaurants

Most restaurants open up in the evening, and the purpose of lighting in such spaces is to highlight the aesthetics. You should use narrower beam light in these spaces but be mindful that they should be somewhat light. A daylight environment within a restaurant would not work well. Furthermore, very narrow beams, such as 10 to 25, can be used to highlight the restaurant’s decor.

Conclusion - Beam Angle

Beam angle describes the spread of light, one of the most important factors to consider while lighting a space. Selecting a wrong beam angle would result in appropriate lighting, which would be too bright in some spots and too dark in others. And to find suitable beam angles, one has to consider several factors. The most important of them is the area, height of the ceiling, and the purpose of the lighting. You will get optimal lighting conditions if you base the decision on all these factors.

What is Anti-Glare Light and How To Reduce Light Glare?

There is a reason why experts do not recommend looking directly towards the sun. The glare coming from it can strain our eyes which not only impairs vision but also produces headaches. But it is not just the sun that can produce the glares; every light source has that potential, be it LEDs or traditional incandescent bulbs. Looking at either can produce the same symptoms as looking directly towards the sun, albeit less severe. Fortunately, the anti-glare lights offer a solution to it. And it is precisely what we will discuss in this piece. So, let’s get straight to it.

What is Glare and How Does It Impact Our Health?

Light plays a vital role in our vision. We can see objects only when light bounces off them and reaches our eyes. But our eyes can only withstand a certain intensity of light. When the intensity exceeds our limit, it impairs vision. And that light that impairs our vision is known as glare. It is the same phenomenon we experience if a car coming towards us has a high beam pointed directly towards us.

Furthermore, even if the light source is not pointed directly towards us, it can produce glare. It can reflect off another object and come in contact with our eyes. Glares can strain everybody’s eyes, but it is more severe in people with impaired eyesight. Experiencing glare for a long time can cau

se significant discomfort. It can trigger migraines in susceptible individuals and produce headaches and even nausea in some people.

Hence, avoiding glare from all lights, whether in homes or offices, is essential.

How Do You Measure The LED Glare?

The intensity of light that can produce glare varies in different environments. The ambience lighting creates a crucial role in determining what constitutes a glare. Our eyes can adapt to the ambient environment after some time. Hence, when the ambient lights are brighter, the intensity required to produce glare will be higher. On the other hand, if the ambient lights are on the darker side of the spectrum, the rays from computer screens would be enough to produce glare.

Furthermore, different areas in homes and offices have varying lighting needs. So, you cannot just select one type of LED in all portions. You must select an LED that provides enough lumens to ensure utility while not being too bright to produce glares. Fortunately, it is not that difficult because of UGR or Unified Glare Ratings, based on European Standards. It enlists the UGR with appropriate applications.

LEDs with a UGR of less than 19 suit applications like writing, reading and other office-based works. In warehouses and technical drawing rooms, LEDs with a UGR of less than 16 work the best. And anything below 14 will work for the general home lighting. Lights with a UGR of more than 30 produce high-intensity glares in every lighting environment. However, remember that UGR works only when selecting the lights for indoor conditions. It is the measure of the relative difference between the ambient lighting and the brightness of LED that suits a particular environment.

What is an Anti-Glare Light?

Anti-Glare is a special light designed for people sensitive to bright lights. Such lights produce gentle lighting, which is easy on the eyes and does not produce any strain. Your eyes take much less time to adjust to such an environment, making reading and writing easier. Furthermore, it does not come at the expense of luminosity and ensures optimal utility.

Such lights are ideal for individuals that have limited exposure to direct sunlight. People that stay indoors would find anti-glare lights very beneficial. You can use these lights in living rooms and bedrooms to read, write and watch TV. When these lights are on while watching TV or working on a laptop, they reduce the strain on your eyes. Hence, you can improve productivity and entertain yourself without feeling fatigued.

Anti-glare lights eliminate the need for brighter LEDs that produce more glare. You get optimal lighting conditions without risking the health of your eyes with these lights.



How Do Anti-Glare Lights Work?

Companies use different technology to produce anti-glare LED lights. Some of them employ prismatic diffusers, while others use anti-glare films. The fundamental purpose of all technologies is to reduce the glare coming from the direct source.

How to Check Whether a LED is Anti-Glare?

Anti-glare LEDs typically have micro-prismatic technology. It works as a diffuser and distributes the light evenly. The homogenous light it produces prevents glare and maintains a balanced lighting environment in the entire space. Credible manufacturers provide this information on the label of products. So, before purchasing an LED light, ensure it features micro-prismatic technology to prevent experiencing glares.

Benefits of Anti-Glare Lights

Installing anti-glare LEDs at home and workplaces offers several benefits. Let's take a look at some of them:

1. No Eye Strain

We have discussed the repercussions of eye strain earlier, and the lack of eye strain with anti-glare lights is probably their most significant benefit. People sensitive to brightness would experience no stress with these lights. Furthermore, patients who experience migraines would also benefit from less intensity. But people who spend most of their time, especially at night, working on computer screens would benefit from it the most. The anti-glare lights will produce a comfortable ambient environment. And it would prevent fatigue, consequently improving productivity.

2. No Harsh Shadows

When a particular portion of an area receives more light than the others, it produces shadows. And the shade cast on the book or notes you are reading makes things difficult. With anti-glare LEDs, there would not be any such problem. These lights spread out evenly and thus do not produce harsh shadows.

3. No UV Rays

Contact with UV rays for a long time can lead to premature aging and many medical problems. And it is not just the sun that produces these rays; any light source can generate them. The LEDs in your homes and offices also have these rays, albeit in fewer amounts. However, the anti-glare lights produce the least amount of UV rays, making them the safest to use.

4. Better Aesthetics

Traditional LED lights produce decent aesthetics, but anti-glare lights take things to another level. You will feel the improvement in aesthetics the moment you turn these lights on. The atmosphere and vibe that these lights produce are fun and healthy.

5. Better Lights on Sports Courts

Glares produce great inconvenience in all sports, especially in tennis and badminton. Installing these lights will eliminate that, and you can enjoy the sport better. Furthermore, the spectator will also have a better view of the game from a distance.

6. Longer Lifespan

Similar to traditional LEDs, anti-glare lights also have a long lifespan. Once you invest, you will not need to replace these lights for years. You must install them in hard-to-access areas so you do not have to experience the inconvenience every month.

How To Reduce Light Glares

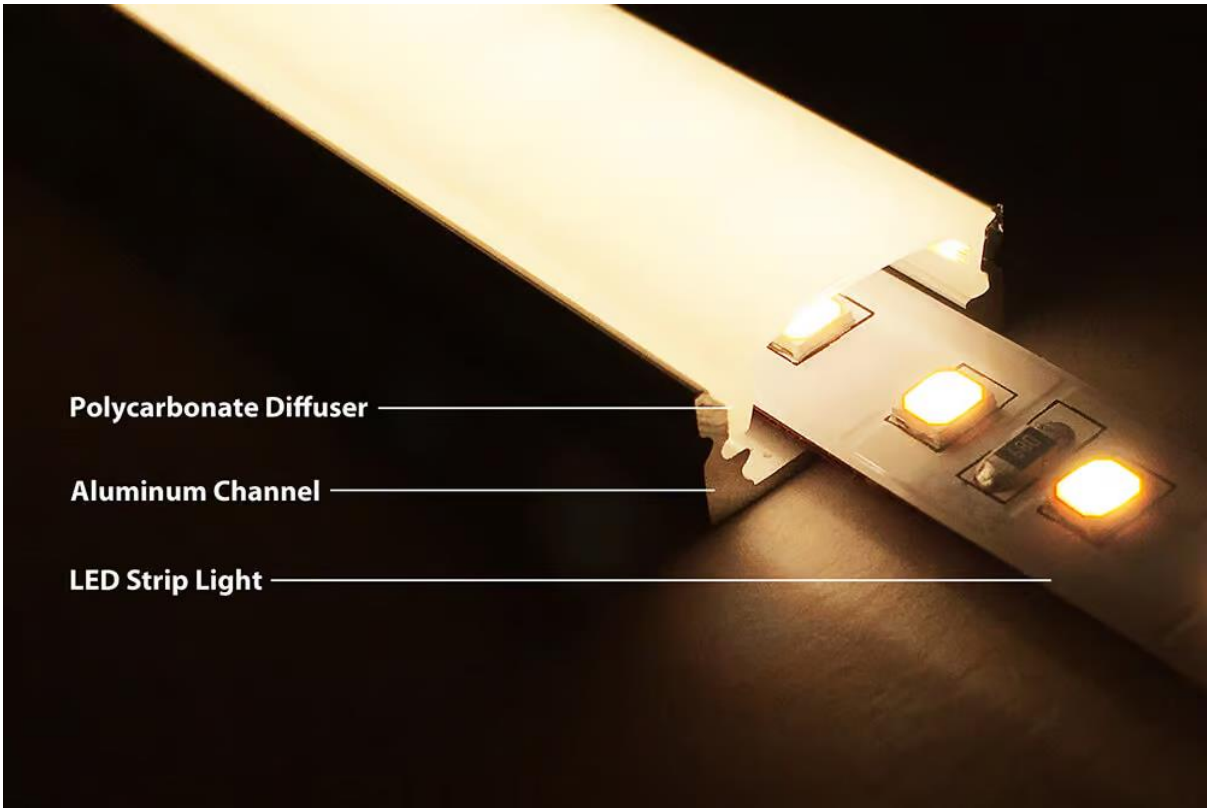
Now that you know the benefit of reducing light glares, let us tell you that you do not necessarily need anti-glare lights. Although anti-glare lights are the ideal solution, specific components can also make the existing LEDs anti-glare. Let's take a look at them:

1. Anti-Glare Filters

You can apply anti-glare filters to the existing LED fixtures to reduce glare. These filters minimize mirror-like reflections and diffuse the glow. Furthermore, some filters can also reduce UV rays by 80%. And the best part? These are probably the cheapest solution to making any lighting source anti-glare.

2. Diffusers

As the name suggests, diffusers are translucent and semi-transparent glass covers. You can install them over the light source to make them anti-glare. Diffusers reduce the intensity of lights by spreading them evenly around the area, thus decreasing the glare. They work best with LED strips in spaces like offices and classrooms.



3. Dimmers

You understand that the high intensity of lights produces glare, which means that reducing intensity would also decrease the glare. Hence, you can use dimmers to control the brightness of lights to dim them when it gets too bright. You would have to replace the switches with dimmers, but that would not require a hefty budget.

4. Adjust Angles of Fixtures

Managing glare indoors is easier compared to outdoor lighting. In addition to the intensity, the angle at which the light points also produces a glare. Hence, adjusting the fixture to a right angle can fix the problem. Depending on the applications, lights in different areas have varying ideal cut-off angles. It would be best if you kept the angle less than 40 degrees for professional lighting needs, 30 degrees for offices and less than 20 degrees for general home lighting.

5. Right Color Temperature

Color temperatures do not just determine the mood of lighting but also the brightness. Anything above 6000K would produce glare; hence, we do not reco

mmend using them at home. The best color temperature for indoor lighting is under 4000K because their light is warm and does not generate glare. Furthermore, the brightness provided by these color temperatures is enough to carry out all the tasks.
For information, you can read 3000K vs 4000K: Which Type of Lighting is Good For Home?



6. Lens Cover

You will find several lens covers in the market. They control the distribution of light from the source and prevent glare. Prismatic and Polycarbonate lenses are the two common examples of these lenses. Prismatic lenses have hexagonal patterns, which adjust the direction of light and spread it evenly. Such lenses are suitable for LED battens and LED panels. Polycarbonate lenses work similarly, but they can withstand heat much better. Hence, you used these lenses on the lights that require more watts.

7. Louvers

Louvers assemble the LED lights in a manner that distributes the light even from the fixtures. You can select from various options depending on the number and size of LEDs. They range from small-cell plastics to large aluminum frames with parabolic fluorescents—these work best in offices, classrooms and indoor sporting courts.

Direct Lighting Vs. Indirect Lighting

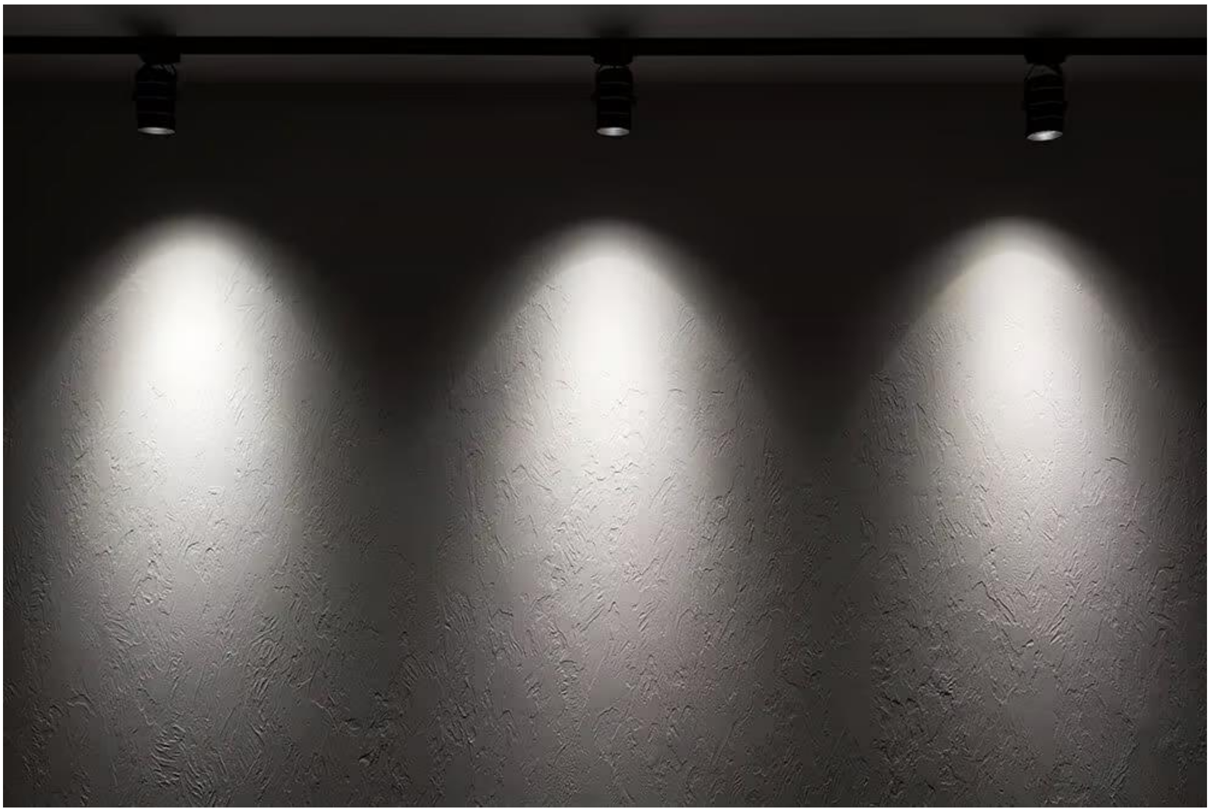
Direct and Indirect lighting are the most popular lighting schemes. But your lighting plan will only go right with proper knowledge about them. So, before working on any light project, know the differences between- Direct Lighting Vs. Indirect Lighting.

Direct lighting emits light rays to focus a particular object/direction. As a result, they create hotspots and uneven lighting. Meanwhile, indirect lighting diffuses lights to illuminate a vast area. And so, they form smooth and even lighting.

Continue reading to learn more about their differences and decide which one is better-

What Is Direct Lighting?

Direct lighting is when a light source illuminates, concentrating in a specific direction. Such lighting is used to highlight a small area. Here, the rays of light fall in a downward direction, creating a hotspot at the center. For example- the lighting of a desk lamp.



What Is Indirect Lighting?

In indirect lighting, the light source emits its ray in an upper direction to illuminate a wide space. In such light, the light diffuses instead of focusing on a particular area. Thus, it gives smooth lighting to the entire room.

Another feature of such lighting is that it doesn' t get to your eyes from the source. Instead, it reflects the ceiling/ground and spreads throughout the room.



What Are The Differences Between Direct Lighting and Indirect Lighting?

Direct and indirect lighting has many dissimilarities to discuss. So, the differences between these lightings are as follows-

Direct Lighting	Indirect Lighting

Direct lighting illuminates a particular object or area.	Indirect lights diffuse to lighten a large area.
The maximum (up to 90%) light is directed downward in direct lighting.	Maximum (up 90%) light is directed upwards in indirect lightning.
Direct lighting creates a hotspot.	Hotspots are not created in indirect lighting.
Scattered and uneven light rays are produced in direct light rays.	Indirect lighting provides parallel and even lighting rays.
This type of lighting is more concentrated.	Such lighting is less concentrated.
Direct lighting gives a warm appearance.	These lightings give a cool vibe.
In direct lighting, the light source is visible.	The light source remains hidden in indirect lighting.
The shape of the direct light source is curved.	An indirect light source is flat in shape.
The lower hemisphere of the direct light source emits most of the lighting.	The lower hemisphere of indirect light emits only 10% of lighting. But, most of the light is emitted from the upper hemisphere of the light source.
Detailing is not impressive, especially on fabric or skin.	They provide detailing with natural looks.
Direct lighting is cheap and available everywhere.	This lighting is expensive.
Studio-like, fake appearance is visible in direct lighting.	Indirect lighting gives natural and sunlight effects.
Examples of Direct Lighting - bulbs, spotlights, desk lamps, etc.	Examples of Indirect Lighting - LED strips, wall washers, recessed lights, etc.

Uses:HouseOffice Industry Street Outdoors	Uses: Conventional hallHotelsCinema hallsInterior decoration

Pros Of Direct Lighting

The direct lighting approaches a straight object. Such lighting has particular uses as it brings many benefits. These are as follows-



Focus

The primary purpose of using direct lighting is to focus on a particular object. For example - a table lamp, focus the light towards your reading area.

Highlight

Direct light creates hotspots in a fixed direction to grab your attention towards it. They are used at museums, exhibitions, or showrooms to highlight structures or products.

Safety

Direct lighting is fantastic for lighting risky and dark areas like - stairs or roads. They lighten up these areas to ensure safety.

Aesthetic

Placing a direct light on your interior gives your decoration an aesthetic look. Besides, it creates shadow effects to provide the walls with an attractive appeal.

Cons Of Direct Lighting

Besides advantages, direct light also has some drawbacks. These are-

- Creates hash shadow
- Causes reflection on the screen
- Glares, causing stress to the eyes
- Uneven lighting
- The ceiling area remains dark as most of the light directs downward

Pros Of Indirect Lighting

Indirect lighting is widely used for interior and exterior decorations. Let’s discuss the benefits of this type of lighting-

Illusion Of Vastness

The light source in indirect lighting remains hidden. And so, it gives an illusion of vastness. You can’t see the lights but can enjoy the illumination. So using them, you can make your space feel spacious and more extensive.

Reduce Glare

Indirect lighting doesn’t create hotspots in a specific area. Instead, light spreads evenly to the surroundings. So they reduce glaring and do not cause harm to your eyes. These lights’ inability to reflect on the screen is an additional benefit. So, indirect lighting is ideal for rooms with tv, computers, and other screens.

Soothing Effect

Indirect lights fall evenly in all directions, which gives a smooth lighting and calm vibe. So you can use them in your bedroom, dining area, kitchen, or bathroom. They are also ideal for creating a relaxing mood in the spa, salon, or commercial spaces.

Highlights Structures

Indirect lightings are great for highlighting unique structures. For example- install them on your furniture or wall textures. They are also great for highlighting automobiles and marines. So they are great for both interior and exterior lighting.

Cons Of Indirect Lighting

There are some drawbacks to consider for indirect lighting. These are as follows-

- Not bright enough
- The whole room seems dark if used only on the ceiling
- Poor visibility

Therefore, before going for direct or indirect lighting, you should consider these pros and cons mentioned above.

When to Use Direct & Indirect Lighting

Direct light is to be used when you need to focus on a small portion of the area. Meanwhile, indirect lighting is used for lighting up ample space. To make the concept clear, go through the uses of these two lighting-

Direct Lighting - Uses

Some of the most common use of direct lights are as follows-

Home & Office

Direct lights are used for work at home and office. For example- you can set direct lighting at the corner of a bookshelf or on the top of your dining table. Again direct lighting is great to hang over the office's conference table.

Work/Study Table

The table lamp on your study table is the most common use of direct lighting. While reading your book or working at your desk, such lights illuminate the area for easy visibility.

Kitchen

Direct lights are used over the working station of the kitchen. So you can chop and process the food in sufficient lighting. Further, you can use them over the sink area of your kitchen for convenient dishwashing.

Museum & Art Gallery

Museums and art galleries exhibit various historical pieces, sculptures, and artworks. And in doing so, direct lighting plays a significant role! The hanging lights fall directly to the specific artwork/sculpture and highlight it to the visitors.

Street Lights

You must have observed the lights on the street or rail track lights. These lights focusing downward are perfect examples of direct lighting. They glow up a particular area of the street. Thus, direct lighting helps to walk around the streets at night without worrying about darkness.

For Decoration

Besides lighting functions, direct lights also look fantastic as decorative pieces. You can hang a natural glow to any part of your house/office to give it an aesthetic look. They are also used in restaurants and hotels for this exact purpose.

Indirect Lighting - Uses

Indirect lights are getting more popular day by day. It could be home, office, or outdoor lighting; indirect lighting is in great demand! Here I've highlighted some everyday use of indirect lighting-

Ceiling & Wall Lighting

In lighting the ceiling of your house/office, indirect lights are your best choice. They give a modern and calm approach to your area. In such lighting, indirect lighting is set around a false ceiling. For example- you can get flexible LED strips or LED neon strips to light up the top. They illuminate to give your room attractive lighting.

Kitchen Cabinet

Glow your kitchen by adding indirect lighting to it! For example, use LED strips under and above the cabinets to highlight their designs. Besides, lighting under the cabinet allows working with sufficient lighting.

More information, you can read How To Choose the LED Strip Lights For Kitchen Cabinets.

Bathroom

Indirect lights are ideal for placing around the ceiling, mirror, or bathtub rims of your bathroom. In this case, waterproof LED flex stipes by LEDYi can help you!

Automobiles & Marines

You can add indirect lighting on automobiles using flexible LED strips. Place them under your car, on the headlights, or beneath the seats. Aside from these, indirect lighting is excellent for decorating boats/ships.

Hotel & Restaurants

The interior and exterior outlooks of hotels and restaurants must be top-notch to attract customers. And appealing decorations using indirect lighting will assist you in increasing engagement.

Architectural Designs

Indirect lighting highlights the exterior and interior structure of buildings. For example - use them on the building facade and around the window. Besides, you can use them on stairs as accent lights.

How To Use Direct & Indirect Lighting Together?

Using direct lighting, you can brighten up a specific spot. On the other hand, indirect lighting illuminates the whole area but has poor visibility.

So, to come up with the best light setting, you should combine direct and indirect lighting. But how’s that? Doing so is quite simple.

Suppose, in lighting your kitchen, use indirect lighting on the cabinets. It will light up the whole kitchen giving it a cozy look. But install a direct light above your workstation. By doing so, you won’t face the insufficiency of light during work.

This way, you can use indirect lighting to illuminate a large area. And for highlighting particular or working spaces, use direct lighting.



Direct Lighting Vs. Indirect Lighting- Which One Is Better?

Though indirect lights are expensive, they are still better than direct lighting in many ways. Read the below section to know why-

- Direct lighting focuses the light beams on a specific area. So, they create hotspots at the center, producing hash and uneven lighting. But, indirect lighting diffuses in an ample space. As a result, they make even and smooth lighting without forming hotspots.

- The light source remains hidden in indirect lighting. So the light doesn't cause stress on the eyes. Instead, they create a cool and smooth atmosphere. But, a direct light source hangs downward, glaring in a particular direction. So, it causes stress to the eye to look toward the lighting source.

- Direct lighting gives cheap, studio-like fake lighting. But indirect lighting provides natural lighting, similar to sunlight. So, you get better visibility and detailing with indirect lighting.

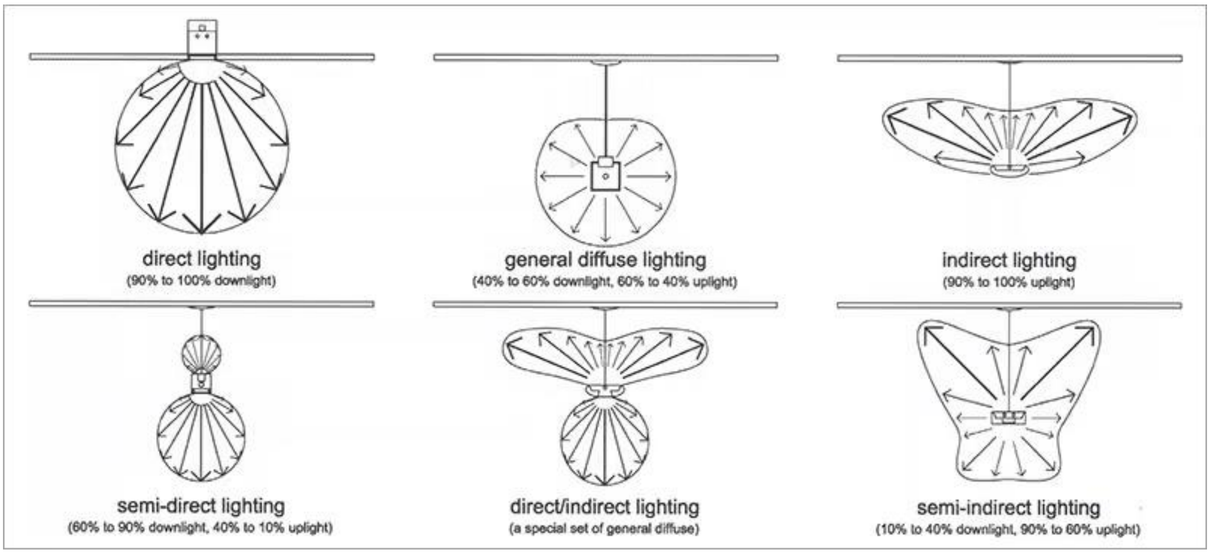
- Indirect lighting is clean and gives your decoration a classy and modern approach. But direct lighting looks more traditional.

- Regarding energy uses, indirect lights use LED strips that save energy. In contrast, fluorescent bulbs used in direct lighting consume more power. So, indirect lights can save you electricity bills.

So, for all these reasons, indirect lighting is better than direct lighting.

Types Of Lighting Schemes

Lighting schemes are divided into five types. These are as follows-



Direct Lighting

Direct lighting emits up to 90% of light in the downward direction. The curved reflecting surface at the top absorbs the rest 10% of the rays in the upward trend.

Semi-Direct Lighting

In semi-direct lighting, 60% - 90% of lights fall in the downward direction. And about 40%-10% of light directs in an upward trend. Such lights are used in offices, hospitals, or reception rooms.

Indirect Lighting

In indirect lighting, 90% of the lights illuminate upward. And the rest falls downward. Such lighting is expensive. That is why they are used for particular purposes; conventional halls, 3-star hotels, etc.

Semi-Indirect Lighting

The percentage of light emission in semi-indirect and semi-direct are the same. But the difference is in the direction. Here, 60% - 90% of light is directed upward. And the rest of the lights are directed or reflected downward.

General Lighting

In the general lighting scheme, the light spreads to all directions equally. The light of a chandelier is an example of a general lighting scheme.

Asymmetric Lighting Vs Symmetric Lighting

While purchasing any floodlights, the matter of beam angle may confuse you. To clear up this confusion, you should know about the angular configuration of different lighting types. Asymmetric and symmetric lighting are the most common types of LED lighting. And they play a crucial role in creating optimum lighting effects.

The main difference between asymmetric and symmetric lighting is their direction of light flow. Asymmetric lighting emits light targeting a particular approach. Besides, it reduces light pollution and unwanted glare. But symmetrical lighting extends the light beams to every direction equally. Plus, it wastes light and creates intentional and unintentional glaring.

Apart from these, you should know many more facts when choosing between asymmetric and symmetric lighting. In this article, I' ve discussed the pros, cons, and uses of these two lighting techniques. So, continue reading to learn more-

What Is Asymmetric Lighting?

Asymmetric lighting focuses on a specific area. It has a reflector that works as a mirror to concentrate the light beams without spreading in all directions. That is how it eliminates unwanted light glare and reduces light pollution. And the finest examples of asymmetric lighting are street lamps, stadium lights, lights in the theater, etc.

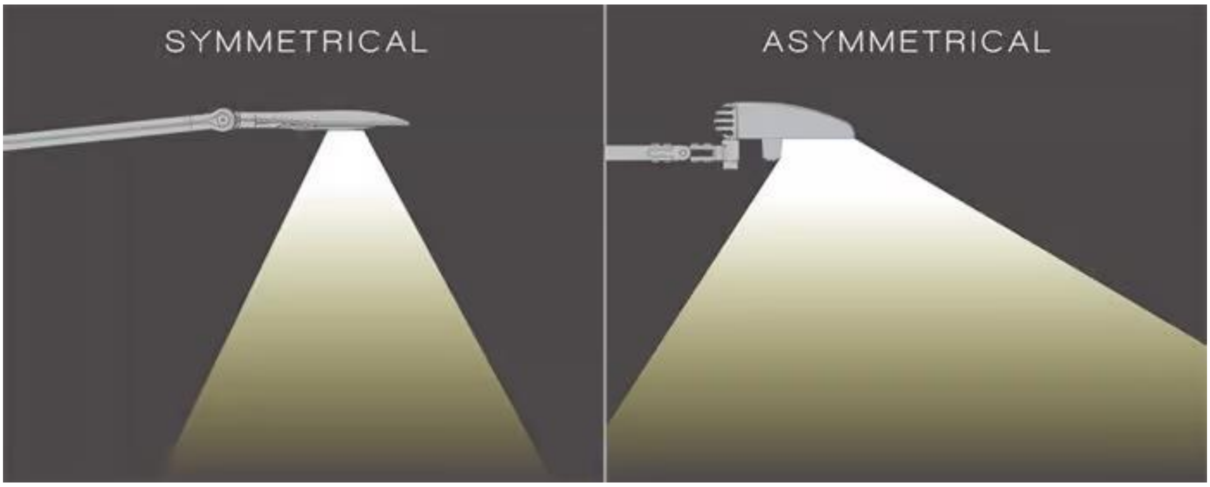
Asymmetrical Lighting: Historical Background

The first asymmetric light fixture appeared in the 1960s. The primary intention of this invention was to create even lighting on the surface. And afte

r many modifications, today asymmetrical lights are widely used for many purposes.

What Is Symmetric Lighting?

Symmetric lights are suitable for illuminating large areas. It spreads evenly in all directions without concentrating on a specific region. And so, symmetric lighting is recommended for outdoor spaces and accent lighting. Plus, you can also use it for indoor and garage lighting.



Differences Between Asymmetric Lighting And Symmetric Lighting

The differences between asymmetric and symmetric lighting are as follows-

Asymmetric Lighting	Symmetric Lighting
Asymmetric Lighting enlights a specific area in a definite direction.	Symmetric lighting spreads in all directions equally.
This lighting is ideal for focusing on a small area.	In illuminating a large area, symmetric lighting works best.
Unintended glaring is reduced with asymmetric lighting.	Symmetric lighting causes intended and unintended glare.

Asymmetric lighting prevents light pollution.	This lighting causes light pollutio n.
This lighting produces a narrow be am angle.	A wider bim angle is created in Symm etric lighting.
Such lighting is an effective solu tion for the workplace.	Symmetric lights are adequate for ge neral lighting.
Asymmetric lighting reduces eye st rain.	As symmetric lighting produces unnec essary glaring, it causes eye strai n.
The brightness of the light is dif ferent in different directions.	Light brightness is equal in all dir ections.
Asymmetric lights are energy-effic ient.	Such lighting wastes energy.
Nearly no backlight is produced in asymmetric lighting.	Symmetric light creates backlightin g.
Best For:Focusing on a specific re gion Workspace and street lighting	Best For:General lighting of large a reaAccent lighting

Asymmetric Lighting Vs Symmetric - Which One Is Better?

Let’s compare asymmetric and symmetric lighting to find the better one-

- Asymmetric light focuses on a particular area without illuminating th e unwanted regions. Thus, it prevents light pollution. Meanwhile, sym metric lighting spreads the light ray to a large extent. It thus enli ghtens the unintended areas causing light pollution.

- Symmetric lighting glare causes eyestrain. But asymmetric lights only glare at the directed angle. So it reduces unwanted glaring and does not cause stress on the eye.

- Asymmetric lighting has a reflector to produce more concentrated light with the least energy usage. But, symmetric lighting wastes energy on lighting up the whole room where it is not required. So, it is less energy-effective than asymmetric lighting.

- Symmetric lights are suitable for lighting up a large area. But asymmetric only focuses on a particular site. So, it is not ideal for illuminating large areas.

So, both the illumination is good in their particular sectors. Asymmetric lighting can better direct the light source to a specific region. Yet, symmetrical lighting is best for general lighting or ample illuminating space.

But considering the cost-effectiveness and glare reduction, asymmetric lighting is somehow better than symmetric lighting. Why so? Let’s understand the matter creating a situation-

Suppose your exam is knocking at the door, and you must prepare well by studying all night. And in such a situation, lighting the entire room should disturb others to sleep. But think of using a desk lamp with asymmetrical lighting that focuses only on your books. So you can study without disturbing anyone around since it will not create any unwanted glaring. Plus, it saves your electricity bill. That is why asymmetric light is a better option for specific lighting tasks.

Advantages Of Asymmetric Lighting

Asymmetric lighting is suitable for interior and exterior lighting. Besides, such lighting comes with a wide range of advantages. These are as follows-

Lighting A Particular Area

When intended to light a particular space, asymmetrical lighting is your best option. That is because it only focuses on the area that requires enlightenment. So, go for asymmetric lighting if you want to pop up any particular region of your room or space.

Prevents Light Wastage

Enlightening the unnecessary areas is a complete waste. So, asymmetrical lights illuminate only the part that requires lighting. So, no light pollution takes place in such lighting.

Limited Light Source

Asymmetrical lighting creates narrow beams to illuminate an intended area. Plus, there is no back blow of light. Instead, it uses minimal energy for enlightening. Thus, it eradicates the need for extra lighting.

Cost-Effective

Asymmetrical lighting reflects light in a fixed direction. Thus it produces more concentrated light by using less energy. So, asymmetrical lighting benefits you by saving your electricity bills.

Disadvantages Of Asymmetric Lighting

Besides these advantages, asymmetric lighting also comes with a few drawbacks. These are-

- Asymmetrical lighting is not suitable for general lighting. Instead, it is intended for specific visual tasks.
- As no backlight is produced in the asymmetric lighting, the other half remains dark. So, it needs adequate lighting to work around the entire room.

So, these are the disadvantages of asymmetric lighting. So, before installing it for your lighting project, keep these points in mind.

Where To Use Asymmetric Lighting?



After knowing all these benefits of asymmetric lighting, you may wonder where to use them. You can use asymmetrical lighting in open or closed spaces. Yet, here are a few common uses of asymmetric lighting-

Workstation

Asymmetric lighting is excellent for directing lights to a specific area. That is why they are great for enlightening the workstation—for example- office table, study table, cooking station, etc.

Stadium

In lighting the stadium, an asymmetric light source works excellently. Because they only focus on the playing ground allowing the audience to watch the match easily. Thus, with asymmetrical lighting, the stadium's audience will avoid unexpected light glaring issues.

Street

Streetlights are the most common example of asymmetric lighting. In roads, asymmetric lights are used to enlighten specific road zones. Thus, it reduces light pollution.

Theatre

In the theater, only the stage is illuminated, keeping the rest of the area dark. And for such lighting conditions, we use asymmetric lighting in the theater. It focuses only on the platform instead of illuminating the entire hall.

Besides these, asymmetrical lights are suitable for many other purposes. For example, you can use them to highlight any room corner. Thus, they can add an aesthetic look to your interior decorations.

Advantages Of Symmetric Lighting

The advantages of symmetrical lighting are as follows-

Lighting Large Spaces

Unlike asymmetric lighting, symmetric lighting does not concentrate on a particular area. Instead, it spreads the light beam in all directions equally. That is why symmetric lighting is suitable for lighting large spaces.

Even Light Flow

Symmetric lighting does not focus light beams in a specific zone. Instead, it flows evenly. So, they are great for regular lighting uses.

Supports Visual Activities

Symmetric lighting illuminates the entire room that supports proper visualization. Thus it allows working around the whole room with the adequate light flow in every corner.

Disadvantages Of Symmetric Lighting

The disadvantages of symmetric lighting are as follows-

- Symmetric lighting causes intended and unintended light glare

- Causes eyestrain
- Light pollution occurs due to lighting in unwanted areas
- Not energy-efficient compared to asymmetrical lighting

So, you must know the drawbacks of symmetrical lighting before installing it.

Where To Use Symmetric Lighting?

Symmetric lights are the most used lighting in our day-to-day life. Here I’ve presented some common uses of symmetric lighting-

Large Open Spaces

It could be a fair or any outdoor event; symmetric lights are great for use in open spaces. Moreover, such lighting illuminates a large area, which is why it is widely used at functions or programs.

Storage Facilities

In storehouses, store boxes are packed up one after another. And in maintaining such congested areas, symmetrical lights are excellent for adequate visualization.

Open Car Parks

In open car parking areas, symmetrical lights are used to enlighten all the vehicles. So, you can identify your car from a distance among all the crowds.



Indoor Lighting

The lights we use in our bedrooms, living rooms, offices, shopping malls, etc., are generally symmetric. Such lighting is in-demand for regular usage as it illuminates the entire area of your room equally.

How to Identify Symmetrical And Asymmetrical?

You have already learned about symmetrical and asymmetrical lighting from the above discussions. But how to identify them? No worries, I’ve pointed out some techniques following which you recognize them-

Direction Of Light Flow

Symmetric light emits light in both forward and backward directions. But asymmetric light doesn’t produce light backward. So, when you find an even flow of light in all orders, identify it as symmetric lighting.

Beam Angle

The beam angle of symmetric lighting is broad and spreads on both sides equally. Meanwhile, asymmetric light spreads unequally, creating a narrow beam angle. So, by observing the angles, you can identify them.

Light Glaring

Symmetric lightings create intentional and unintentional glaring. That is because it lights up the entire area. So, the places where light is not required will trouble your eye. But it is asymmetric lighting when the light is directed only to a particular object/area and glaring only at that.

Dark To Light

Asymmetric lighting enlights a specific zone keeping surrounding areas in the dark. Thus, it creates a dark-to-light effect. But if the entire area is lightened up equally without any dark spots, it is symmetric lighting.

So, keeping these points in mind, you can identify symmetrical and asymmetrical lighting.

Everything You Should Know About FPCB

The reason flexible printed circuits were made was to get rid of the need for rigid wiring harnesses. Flexible printed circuits are used in almost every industry because of connectivity, mobility, wearables, shrinking, and other modern trends. At its most basic, a flexible circuit is made up of many conductors that are separated by a fragile dielectric film. Flexible printed circuit boards can be used for everything from the simplest to the most complicated tasks.

History Of FPCB

At the turn of the 20th century, researchers in the new telephone business saw the need for standard, flexible electric circuits. The circuits were made of alternating layers of conductors and insulators. According to a 1903 English patent, the circuits were made by putting paraffin on paper and laying out flat metal conductors. In his notes from around the same time, Thomas Edison suggested using linen paper coated with cellulose gum and drawn with graphite powder. In the late 1940s, when mass production techniques were first being used, several patents were filed for photo-etching circuits on flexible substrates. Adding active and passive components to flexible circuits led to the development of "flexible silicon technology, which describes the ability to combine semiconductors (using technologies like thin-film transistors) onto a flexible substrate. Thanks to the combination of onboard computation and sensor capacity, there have been exciting new developments in many fields with the usual benefits of flexible circuit architecture. New developments, especially in aircraft, medicine, and consumer electronics.

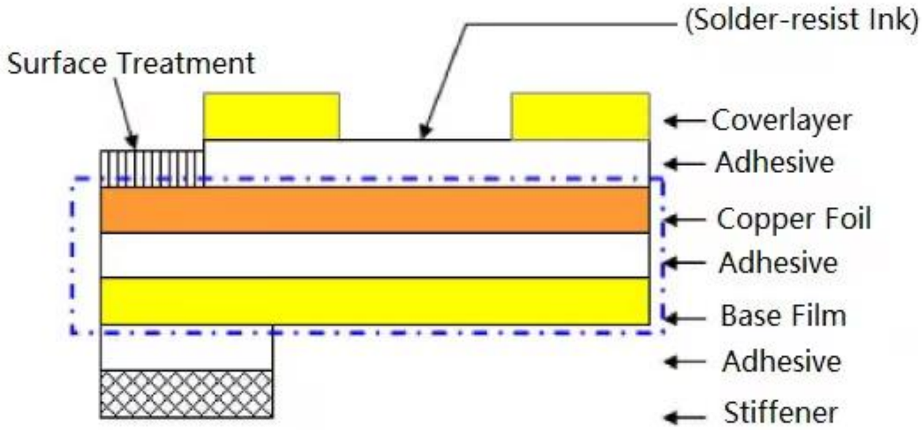
What Is FPCB?

As compared to the regular PCB, there are significant differences in how they are designed, made, and how they work. It's inaccurate to say that modern manufacturing techniques are "printed." Since photo imaging or laser imaging is used more and more to define patterns instead of printing, a layer of metal traces is glued to a dielectric material like polyimide to make a flexible printed circuit. The thickness of the dielectric layer can range from .0005 inches to.010 inches. While the thickness of the metal layer can be anywhere from .0001 inches to >.010 inches. Adhesions often attach metals to their substrates, but other methods, such as vapor deposition, are also possible. Copper can oxidize, so it is usually covered with a protective layer. Gold or solder are the most common choices because they conduct electricity and can stand up to the environment. A dielectric material is usually used to keep the circuitry from oxidizing or shorting out in places where it doesn't touch anything.

Structure Of FPCB

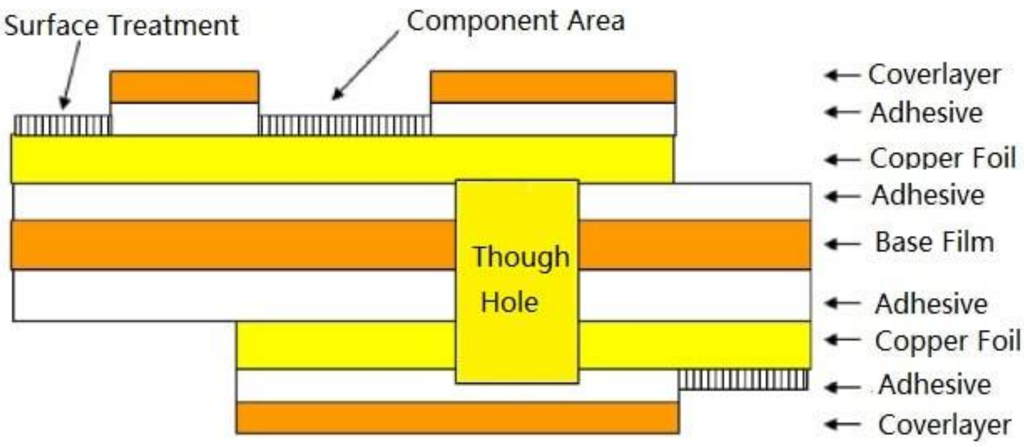
Flexible PCBs can have one, two, or more circuit layers, like rigid PCBs. Most single-layer flexible printed circuits are made up of these parts:

- The dielectric substrate film serves as the PCB's foundation. The most used material, polyamide (PI), has a strong resistance to traction and temperature.
- Copper-based electrical conductors that serve as the circuit's traces
- A protective coating is created using a cover lay or cover coat.
- Polyethylene or epoxy resin is the adhesive substance that holds the various circuit components together.



First, the copper is etched to reveal the traces, and then the protective covering (cover lay) is pierced to reveal the soldering pads. The parts are cleaned and then rolled together to make the final product. The pins and terminals outside the circuit are dipped in the tin to help with welding or keep them from rusting. If the circuit is complicated or needs copper ground shields, switching to a double-layer or multi-layer FPC is essential. Multi-layer FPCs are made in a similar way to single-layer FPCs. But, in multi-layer FPCs, a PTH (Plated Through Hole) must be added to connect the conductive layers. The adhesive material sticks the conductive tracks to the diele

ctric substrate or, in multi-layer flexible circuits, sticks the different layers together to make the circuit. Besides, the adhesive film can protect the flexible circuit from damage caused by moisture, dust, and other particles.



The Manufacturing Process Of FPCB

Schematic capture, printed circuit board layout, and circuit board fabrication and assembly are high-level descriptions of the steps in designing and making a PCB, but the details are complicated. In this section, we' ll look at each step.

- **Construct The Schematic**

Before starting to design the board with CAD tools, it' s crucial to finish designing the library components. This means making logical symbols for parts you can build, like resistors, capacitors, inductors, connections, and ICs. That you can use in the schematic (ICs). Once these parts are ready, you can start by putting them in order on schematic sheets using CAD tools. Once the pieces have been roughly put together, you can draw the wires to show how the pins of the schematic symbols connect. In electronic memory and data circuits, nets are the lines that show single nets or groups of nets. During the schematic capture, you must move the process parts around to make a clear and readable diagram.

- **Circuitry Simulation**

Once you draw the schematic's parts and connections, you can test the circuit to see if it works. You can double-check this by using SPICE (Simulation Program with Integrated Circuit Emphasis) circuit simulations in a modeling program. Before making the actual hardware, PCB engineers can use these tools to simulate the circuits they have designed. PCB design tools are essential because they can save time and money.

- CAD Tool Setup

With today's design tools, PCB designers have access to many features, such as the ability to set design rules and constraints. That keeps individual nets from crossing and gives enough space between components. Designers also have access to a wide range of extra tools. Tools like design grids. It makes it easier to place components and route traces in an organized way.

- Components For Layout

After you have made the design database and the schematic's data on how the nets connect is imported, you can make the actual circuit board layout. First, you must put the component footprints inside the board outline in the CAD program when the designer clicks on an impression. A "ghost-line" graphic showing the net connections and which components they lead to will appear. With practice, designers will learn how to position these parts for the best performance—considering things like connectivity, hot spots, electrical noise, and physical obstacles like cables, connectors, and mounting hardware. Designers can't think about what the circuit needs. Designers also have to think about where to put the parts so that it's easiest for the manufacturer to put them together.

- PCB Routing

Now that everything is where it should be, you can hook up the nets. To do this, you need to make the lines and planes on a drawing from the connections in the rubber-band net. CAD programs have several helpful features, such as automatic routing functions that cut design time, which helps them do this.

It's essential to pay close attention to routing. It is necessary to ensure that the nets' length is suitable for the signals they're carrying and that they don't go through areas with a lot of noise. Because of this, cro

ss-talk and other problems with signal integrity may affect how well the board works after it is made.

- **Establish A Clear PCB Return Current Path.**

You need to connect the most active parts on the board, like integrated circuits (ICs), to a power and ground net. All you have to do to make solid planes that these parts can reach is flood an area or layer. When it comes to making power and ground planes, things are more complicated. These wings also have the vital job of sending back signals along a trace. If the planes have too many holes, cutouts, or splits, the return paths can be very noisy and hurt the performance of the PCB.

- **Final Check Of The Rules**

Your PCB design is almost done now that you've finished putting in components, routing traces, and making power and ground planes. The next step is to set up the text and markings that will be silk screened onto the outside layers and run a final rules check.

Putting names, dates, and copyright information on the board will help others find parts. At the same time, you must make and use manufacturing drawings in creating and putting together PCBs. PCB designers also use tools that help them determine how much it will cost to make the board.

- **Make The Board**

After you create the output data files, the next step is to send them to a manufacturing facility to make the board. After you cut the traces and planes into the metal layers, You need to press them together to create a "bare board" that is ready to be put together. When the board gets to where you can put it together, You can give it the parts it needs. After that, you can put it through one of several soldering processes designed for each part. The board is finally ready now that it has passed all necessary tests.

Materials Used For Making FPCB

FPCB products are not only made of a flexible material but also feel light and thin. The structure is so light that you can stretch it many times without hurting the insulation on the PCB. The soft board can't handle high co

nduction current or voltage because it is made of plastic and is made up of wires. This makes it less useful in high-power electronic circuits. But you can use soft boards a lot in low-power, low-current consumer electronics. Soft boards are rarely used as the primary carrier board in product design because their unit cost is high. This is because the key material PI controls how many soft boards cost per unit. Instead, they are hired to carry out only the "soft" parts of the critical design. Electronic components or functional modules that need to move and work need soft circuit boards. For example, the electronic zoom lens in a digital camera or the read head electronic circuit in an optical disc drive are examples of this. PI, also called Polyimide (PI), can be further broken down into fully aromatic and semi-aromatic PI. You can use it based on its molecular structure and ability to handle high temperatures. Wholly aromatic PI is a chemical compound that is one of the straight types of PI. Things can be soft or hard, or they can be both. Because they are infused, materials that can be injected can't be shaped, but they can be crushed, sintered, and used differently. The semi-aromatic PI is a type of polyetherimide that belongs to this group. Because the material is thermoplastic, injection molding is often used to make polyetherimide. With thermosetting PI, you can use lamination molding of impregnated materials, compression molding, and transfer molding, which need different qualities in the raw materials.

Types Of FPCB

Flex circuits come in eight types, from single-layer to multi-layer to rigid. Here are some of the most common types of flexible circuits.

- **Single-sided flexible circuits:** These circuits have one copper layer between two layers of insulation. Or one layer of insulation (usually polyimide) and one side that isn't covered. The circuit layout is then chemically etched into the copper layer below. Because of how they are made, components, connectors, pins, and stiffeners can be added to single-sided flexible printed circuit boards.

- **Single-Sided Flex Circuits with Dual Access:** Some single-sided flex PCBs have a layout that lets the circuit's conductors be reached from both sides of the board. Using a flexible PCB and specific layers for this design function makes it possible to get to the one copper la

yer through the polyimide layer of the base material.

- **Double-sided flex circuits:** These circuits are flexible printed circuit boards with two conducting layers. These circuits are separated by polyimide insulation. The exterior sides of the conductive layer can be either exposed or covered. Most layers are connected by plating through holes, but there are other ways. Like single-sided versions, double-sided flexible PCBs can hold extra parts like pins, connections, and stiffeners.

- **Multi-layered flexible PCBs.** These circuits use three or more flexible conducting layers with insulating layers in between to make both single- and double-sided circuits. The outer layers of these units usually have covers and a through-hole. They are often plated in copper and run the length of the thickness of these flexible circuits. With multi-layered flexible circuits, you can avoid crossovers, cross-talk, impedance, and shielding problems. There are many ways to design multi-layered circuits. For example, blind and buried vias can build multi-layered flex boards as FR4 can. Also, you could laminate the layers of a multi-layered circuit over and over for extra protection, but this step is usually skipped if flexibility is more important.

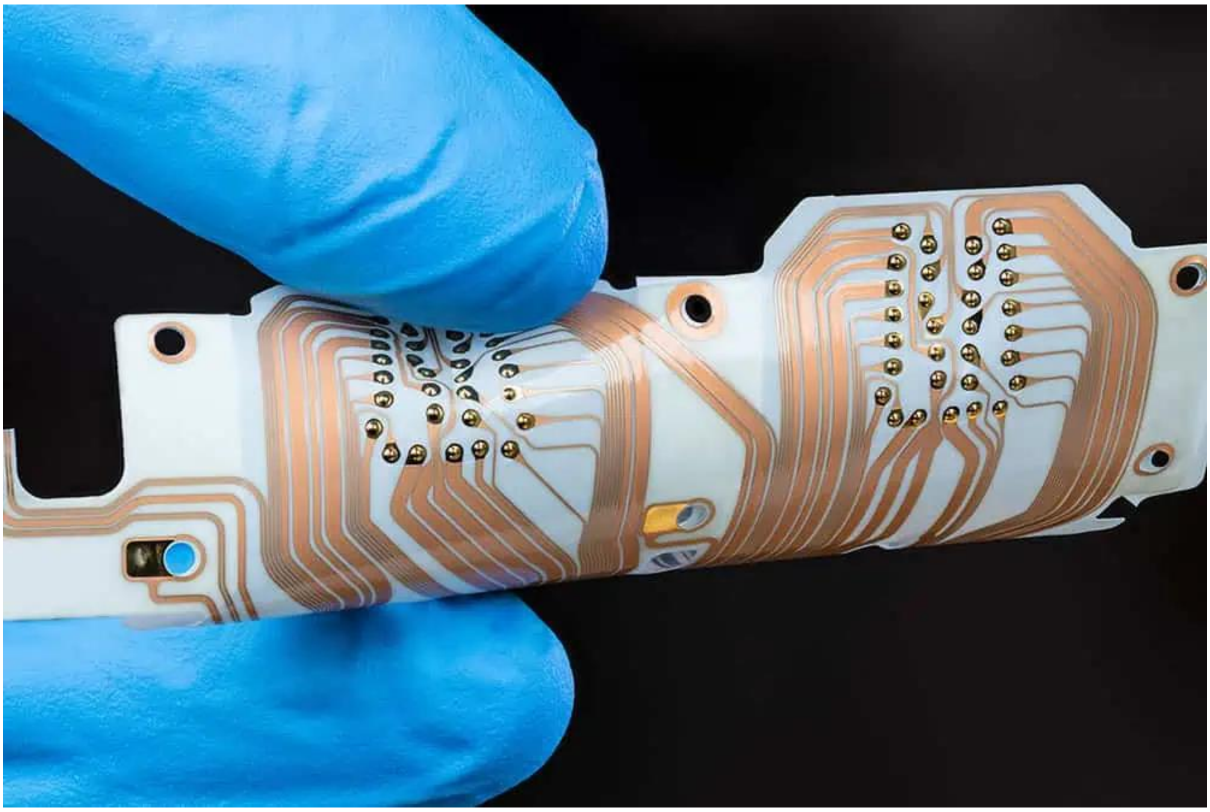
- **Rigid-flexible circuits:** These PCBs are a little different than the others, and they usually cost more than other flexible PCB options, even though they serve the same purpose. Most of the time, these designs have two or more conductive layers, with either rigid or flexible insulation between each one. Unlike multi-layered circuits, they only use stiffeners to keep the unit together, and the conductors are placed on layers that are not flexible. Because of this, rigid-flex PCBs have become popular in the aerospace and defense industries.

- **Aluminum flexible boards:** Flexible aluminum printed circuit boards work best in industries like medicine and cars that use a lot of electricity and light. And because they are small, they may be able to go through small doorways. These are excellent investments because they are cheap, light, and long-lasting. They also have aluminum layers that help heat move through them.

- **Microcircuits:** Flexible microcircuit boards are the best solution for consumer electronics. Due to their lightweight and resistance to shock and vibration, these materials are perfect for consumer electronics. Microcircuits have good signal integrity, so their small size doesn't affect how well they work.

- **High-density interconnector (HDI) boards with flexible circuits:** These have one of the fastest-growing technologies in the printed circuit board business. Because they have more wires than traditional circuit boards, they improve electrical performance and speed while making equipment lighter and smaller. They work great in gadgets like cell phones, computers, and video game consoles.

- **Ultra-thin, flexible printed circuit boards:** These have small, thin parts and board materials. This makes them perfect for electronics that need to be portable or put inside the body. Or for any other use that needs very light circuit boards.



FPCB Applications

A flex PCB is the same as a regular printed circuit board, except the circuit connections, are made with a flexible base material. This is especially helpful for things not meant to be installed permanently. Flexible PCBs are used in more and more industries because they last a long time and take up little space. The following are a few examples of where and how this technology can be used:

- **Automobile industry:** More and more cars have electronic parts. So, it’s essential that the circuits can handle the bumps and jolts that happen inside a car. A flexible printed circuit board is a crucial business option because it is cheap and lasts a long time.

- **Consumer electronics:** Flexible printed circuit boards (PCBs) are often used in consumer electronics. E.g., cell phones, tablets, cameras, and video recorders. The ability of the flexible PCB to handle shock and vibration will come in handy if you need to move these things often.

- **High-speed digital, RF, and microwave applications:** Flexible PCBs are excellent for high-frequency. You can use them in high-speed digital, RF, and microwave applications because they are reliable.

- **Industrial electronics.** Industrial electronics need flexible PCBs that can absorb shocks and stop vibrations because they have to handle a lot of stress and vibration.

- **LED:** LEDs are becoming the standard for lighting in homes and businesses. LED technology is a big part of this trend because it works well. Most of the time, the only problem is the heat, but a flexible printed circuit board’s good heat transfer can help.

- **Medical systems:** As the demand for electronic implants and portable surgical equipment rises. This makes compact and dense electronic designs more critical in the medical systems sector. You can use flexible printed circuit boards in both. Because you can bend them, and they can handle the stresses of surgical technology and implants.

- **Power electronics.** In the field of power electronics, a flexible printed circuit board has the added benefit of handling higher currents because it has very flexible copper layers. This is very important in the business of power electronics since devices need more power when they are running at full capacity.

The Importance Of FPCB

You can use flexible boards a lot in both dynamic and static situations because you can bend them. Compared to rigid PCBs, you can stretch circuit boards used in dynamic applications without breaking. Borehole measurements in the oil and gas industry are perfect for flexible circuit designs. Because they can withstand high temperatures (between -200° C and 400° C), even though flexible boards have their uses, you cannot use them in place of regular circuit boards. Rigid boards are a natural choice because they are inexpensive. You can use them in automated, high-volume fabrication applications. Flexible circuit boards are the way for performance, accuracy, precision, and consistent bending.

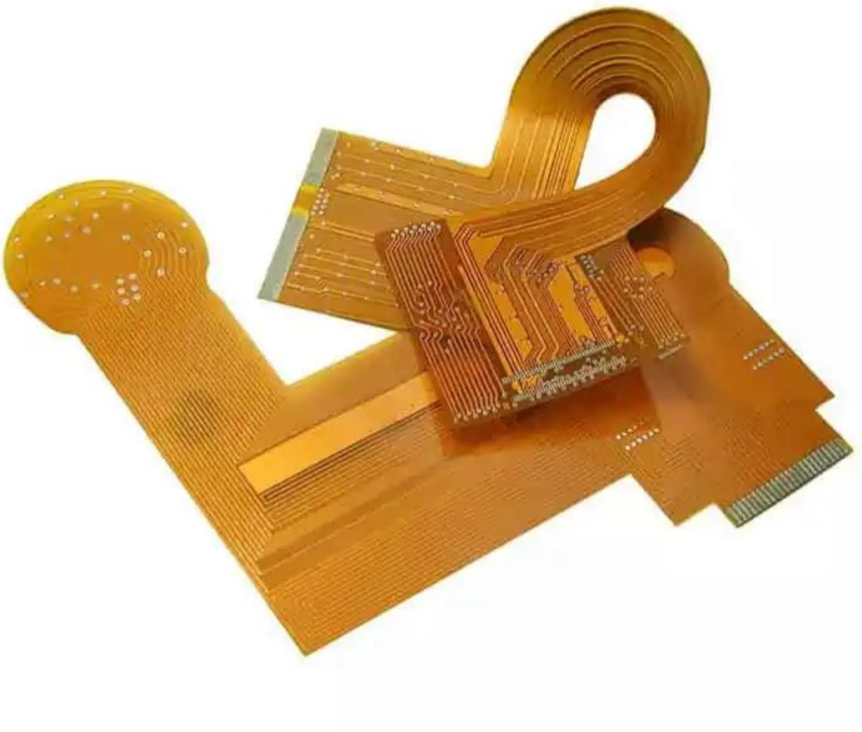
Challenges And Cost Considerations Of FPCB

When working with FPCBs, like when trying to make changes or repairs, problems can happen. You need a new base map or a rewrite of the lithography software to change the design. It's not easy to make changes because you must first strip the board of a protective layer. Length and width are limited because of the size of the machines used to make them. Also, you can break FPCBs if you handle them carelessly. So people who know what they are doing need to solder and fix them.

Cost is always a major factor. However, the application greatly affects how cost-effective FPCBs are compared to rigid PCBs. Since each FPCB application is unique, the expenses associated with initial circuit design, layout, and photographic plates are costly for small numbers.

FPCBs may ultimately be more affordable for higher manufacturing volumes because of the fewer wires, connectors, wire harnesses, and other parts needed for assembly. This is particularly true when the upstream and downstream advantages are considered, such as the reduced supply chain risk and the de

crease in maintenance requests brought on by the availability of fewer parts.



Advanced Features Of FPCB

The flex circuit industry has been growing at a steady pace. Because of this growth, there have been more improvements in technology, such as:

- **Graphic Overlays:** Graphic overlays allow users to talk to the circuitry underneath PCBs. They are acrylic or polyester covers for PCBs. These overlays often have LEDs, LCDs, and switches that let users talk to the PCB the way they want.

- **Hot Bar Solder:** You can use a hot bar solder connection instead of a connector to link a hardboard and a flex circuit. The result is a cheaper connection that is stronger and lasts longer.

- **Laser Skived Slots and Holes:** In the past, You could cut FPCBs with razors. And the quality of the cut depended on how good the person was at using the razor. But with the lasers we have now, we can cut lines with a lot of precision and control, which lets us make even small

er circuits on flexible PCBs.

- **Panelization:** Circuit boards, called PCBs, when put together in large panels of many modules. In "pick-and-place" assembly lines. This can speed up the process of putting together flex circuits by a lot. Step two is to divide the units into smaller groups.

- **Pressure-Sensitive Adhesives.** Pressure-sensitive adhesives stick things together by taking off a liner and pressing an object into the glue. This material is often used on printed circuit boards (PCBs) to keep circuit parts in place without using solder.

- **Shielding:** In the past, electromagnetic interference has been a problem. It has been a problem, especially in places where electronics are more likely to be affected by it. This is less of a problem now because shielding technology has improved. It reduced the noise and made it easier to control the impedance of signal lines.

- **Stiffeners:** Stiffeners made of materials like FR4 and polyimide are often added to flex circuits at connection points. The connection points where the circuit could use extra support. Because of this, the circuit will last longer and work better.

Benefits Of Using FPCB

Flex PCB technology makes it possible to make many new products and layouts. Its malleability is sought-after in electrical parts. Electrical parts like connections, wires, cables, and printed circuit boards. Here are some of the benefits of using flex circuits.

- FPCBs cut the weight of the device by about 70%.

- They give more options for better electronic packaging.

- FPCBs help you fix packing and wiring problems. This is because it is flexible, adaptable, and can change shape.

- FPCBs reduce the need for wires, connections, printed circuit boards, and cables. It helps solve the problem of how to connect things.

- The ability to produce 3D packages is made possible by the material's conformity and slenderness.

- Electrical integration: It's simple to create custom solutions. It allows you to base your design on many material alternatives. Also, you can select from a variety of plating techniques and styles.

- No matter how good or strong your heat sink is, a flexible printed circuit can handle the heat. So, they work well in high-power situations.

- FPCBs provide mechanical and electrical repeatability.

- They cost 30% less than traditional hard wiring and other assembly methods.
- FPCB needs about 30% less space.

- FPCB is more reliable because wiring mistakes can't happen with it.

Drawbacks Of Using FPCB

- A flex circuit's initial circuit design, wiring, and photographic masters are more expensive. They are expensive because you can make them for each application. Flexi-PCBs aren't cost-effective for low-volume uses.

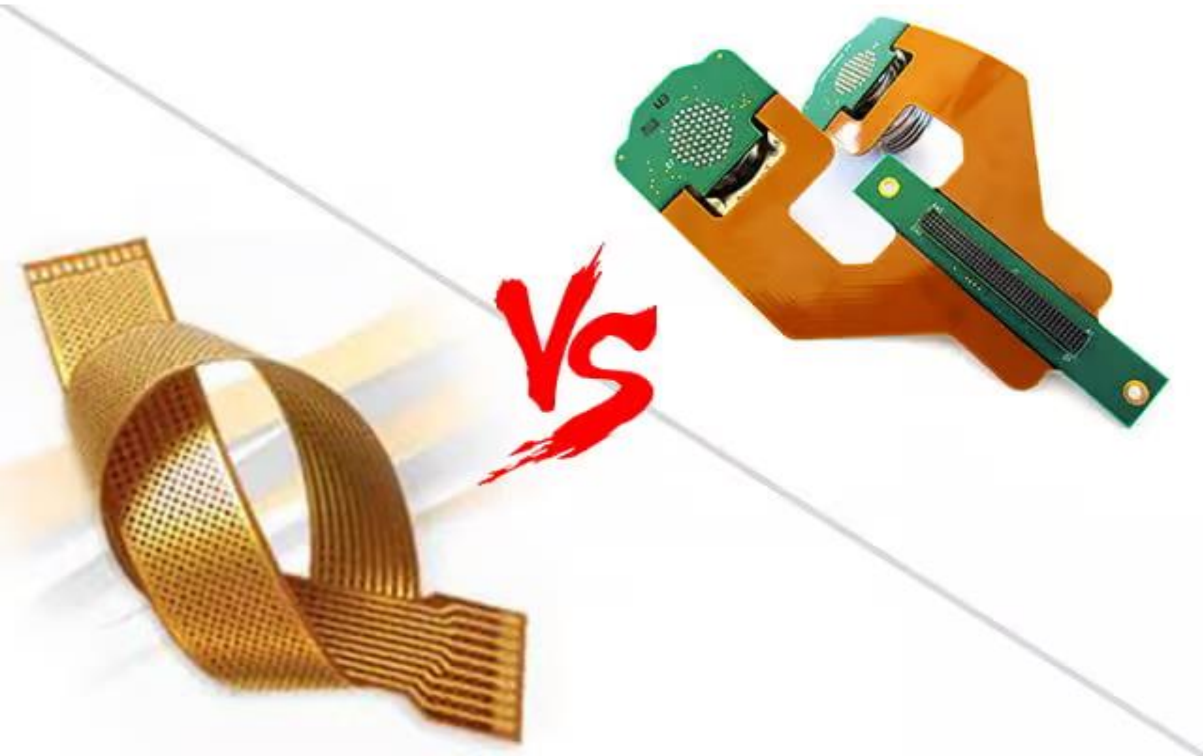
- The flex circuit boards are challenging to replace and repair. Once constructed, you must change flex circuits from the original design or the light drawing program. The surface has a protective layer that you'd need to remove before repair and put back on afterward.

- Because they are small, flexible printed circuit boards are rarely used. So their production is usually done in batches. Because of the size limits of the machinery used to make them, you can't make them ve

ry long or wide.

- It’ s easy to damage the flexible circuit by using it carelessly, and damage can also happen if it’ s not set up right. Soldering and reworking need skilled operators because of this.

Differences Between Rigid PCBs And Flexible PCBs



When most people think of a circuit board, they picture a hard-printed circuit board (PCB). Over a non-conductive base. These boards connect electrical parts with conductive tracks and other parts. Glass is often used as the non-conductive substrate material of a rigid circuit board. Because it makes the board strong and rigid, a rigid circuit board can keep components from getting too hot because of its robust design. You can make traditional circuit boards of hard materials like copper or aluminum. But you can make flexible PCBs that are easier to bend, such as polyimide. Flexible circuits can absorb shock, let off extra heat, and take on a wide range of shapes because you can bend them. Because they are made to be flexible, flex circuits are being used in more and more small, modern electronic devices. There are some significant differences between printed circuit boards (PCBs) and flex circuits.

- Because rolled annealed copper is more flexible than electro-deposited copper, you can use it as the conductive material in flex circuits instead of electro-deposited copper.
- In manufacturing, you can use an overlay instead of a solder mask. You can do it to protect the exposed circuitry on a flexible PCB.
- Even though flex circuits are more expensive, rigid circuit boards are less expensive. But because flex circuits are small, engineers can use them to make their devices smaller. They are saving money in ways that aren't obvious.

Importance Of FPCB In LED strips

As technology improves, LED strips are becoming more and more popular. LED strips are already a great way to light and decorate your home, and flexible PCB only improves things. LED strips are circuit boards that are connected to each other. SMT (Surface Mount Technology) is used to make flexible printed circuit boards (PCBs) with surface-mounted parts (SMD LEDs, connectors, etc.). . When the LED chips are being put together, the FPCB acts as a base for them. As important as the structure of a circuit board is how well it can get rid of heat. Flexible electronics are a big help when it comes to LED strip lights. Like rigid PCBs, various FPCBs are single-layer, double-layer, and multi-layer PCB circuits.

LED Strip Lights Vs Rope Lights: Which Is The Best?

LED lighting is quite popular nowadays for interior design. It adds an aesthetic and attractive look. But, this lighting can be confusing at times. You often have heard this question. What are the distinctive features between LED strip lights and rope lights? Are these lights the same or different?

Let me state clearly that these are two different lighting structures. In this post, we will discuss the features that differentiate these lights. But let us start with a basic understanding of these lights.

What Is An LED Strip Light?

It is a flexible circuit board that has light-emitting diodes mounted on it. We also know these strip lights as LED tape or ribbon lights. These lights usually have adhesive on the backside.

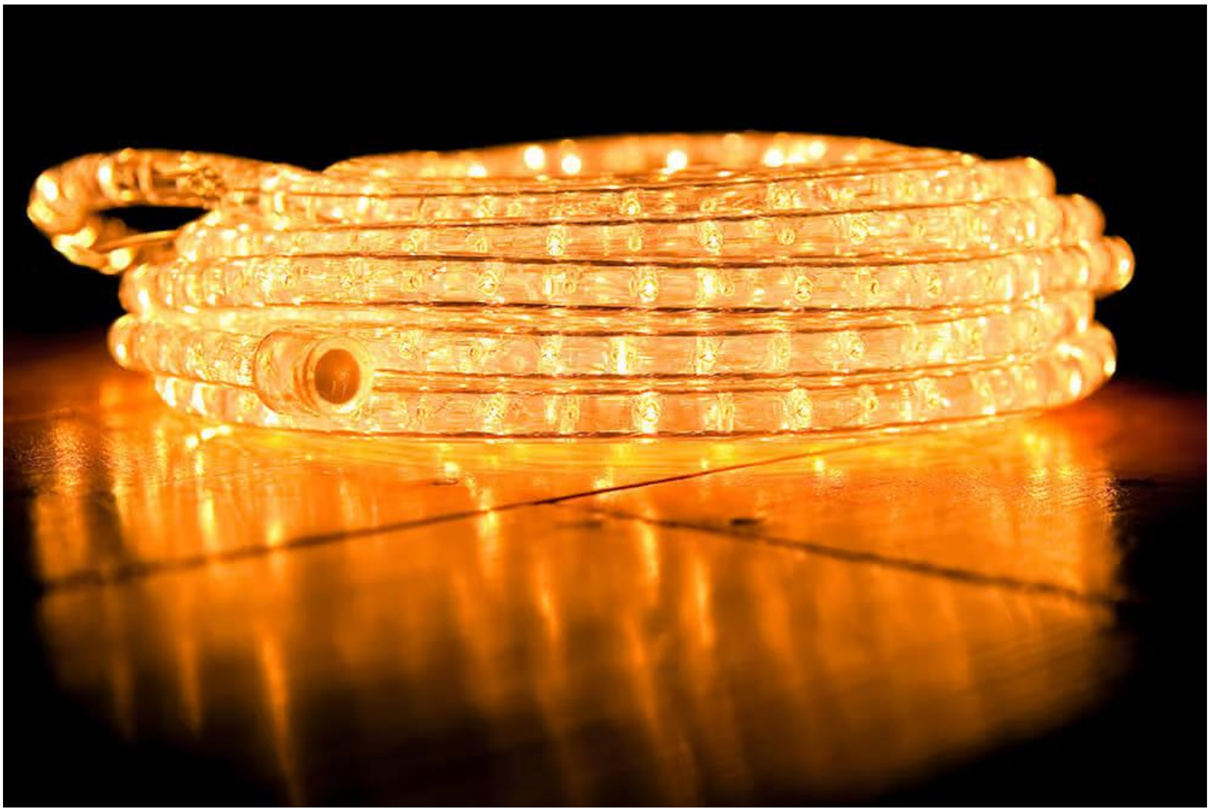
The LED strip lights are flat lights that you can cut into any length. This flat, flexible shape allows you to install these lights anywhere you want. These lights also have quality levels. It means that there are high and low-quality strip lights.



What Is A Rope Light?

These lights have a long cylindrical tube shape. They have an internal light source installed every few inches. Thus, the rope lights give the impression of twinkling or glowing lights. These lights can have a tube or epoxy t

ube. As a result, these materials allow the light to shine through. There can be many cut points along the length of rope lights.



Key Differences Between The LED Strip Lights And Rope Lights:

The LED strip lights and rope lights have some distinct features. These features differentiate these two types of lights. And both of these lights have specific applications. These features are as follows:

- Lighting source
- Size
- Brightness
- Flexibility
- Cost
- Installation
- Light quality
- Beam angle
- IP rating
- Casing material

- Run length

Lighting Source:

Both LED strip lights and rope lights use LEDs. These LEDs are lighting sources. Actually, LEDs have better energy efficiency. But the rope lights can also have incandescent bulbs. These lights can have two types of power inputs:

- 120/220 VAC
- 12/24 VDC

The LEDs of strip lights produce much better illumination. The chips mounted on strip lights come in different sizes. These lights mostly have one type of power input:

- 12/24 VDC

For more information, you can read [How to Choose The Voltage of LED Strip? 12V or 24V?]

Size:

The rope lights are broader in diameter. The tube of rope lights can have a diameter of 1-2 cm. We can install these lights with clips. These clips hold the tube in place.

The LED strip lights are ultra-thin and flexible. You can make single, double, or multi-lighting rows using these lights.

Brightness:

The brightness of rope lights is less compared to strip lights. Moreover, as time passes, the tube gets yellow. Hence, the brightness of these lights fades away. There is also no option for color change in these lights. Thus, the rope lights are fallible for many practical applications. You cannot use these lights as a primary light source. They are not suitable for applications where we need high brightness.

The LED strip lights have a range of brightness. The brightness depends on the chips mounted. The larger the chips mounted, the greater the brightnes

s. The strip lights with 5050 chips have higher brightness. And the strip lights with fewer chips will have low brightness. We can also alter the brightness of these lights. These lights offer a variety of patterns, colors, and dimming options.

For more information, you can read Candela vs Lux vs Lumens.

Flexibility:

The LED strip lights are highly flexible. Generally speaking, we can curve these lights up to 90 degrees. We can easily install them at corners.

The rope lights are also somewhat flexible. But you cannot bend them to greater angles. They are more suitable if you wrap them around poles.

Cost:

It is a common rule that a device having more features will cost more. The same is the case with these lights.

The rope lights have simple configurations and features. Thus, they are inexpensive in comparison with LED strip lights.

The process of making LED strip lights can be complex. We need high-quality materials and professionals. Thus, they are expensive. But if we look as a whole, strip lights are not expensive. It is because they have a longer lifespan and provide better services.

Installation:

Both of these light sources have different installation methods. There is adhesive on the back of the strip lights. This super glue can stick to almost all types of surfaces.

We can install the rope lights by using the clips. They do not have a sticky backing.

Light Quality:

We all know that the quality of a product varies from company to company. But the LED strip lights have somewhat better quality than the rope lights. The strip lights have the following:

- Superior CRI
- Light purity
- Color consistency
- Color accuracy

Beam Angle:

The beam angle of rope lights can be up to 360 degrees. This wide angle is due to the round shape of rope lights. Actually, the tube of these lights is glassy and transparent.

On the other side, the LED strip lights typically have 120 degrees angle. But COB LED strip lights can have up to 180 degrees beam angle.

IP Rating:

The IP rating is the indication of the protection level. The LED strip lights come with different IP ratings. You often would have seen these lights in kitchens, bathrooms, pools, etc.

The rope lights also have a good IP rating. Thus, they are also waterproof. We can use these lights for both indoor and outdoor applications.

For more information, you can read A Guide to Waterproof LED Strip Lights.

Casing Material:

The rope lights use polyvinyl chloride PVC as the casing material. There are light bulbs evenly placed inside them.

Silicone glue is the casing material for LED strip lights. It has excellent resistance against temperature. It also allows increased flexibility of these lights.



Run Length:

Both of these lights have a certain run length before the voltage drops. The rope lights can have 80 meters run length. This run length is when the lights are on AC voltage. This run length drops to 15 meters on DC voltage. After this, they need an extra power input to work.

In the case of LED strip lights, they have DC inputs of 12V or 24V. The length of lights is short when we use the DC version. It is because, for the DC input, the voltage drops easily. The typical size is 5M per reel for strip lights. The strip lights are available in a wide range of widths.

If you need long run, you can try to use our Super Long Constant Current LED Strips or 48VDC LED strips.

Applications Of LED Strip Lights And Rope Lights:

Though both are lighting sources, these lights have somewhat different uses. Some examples of these applications can be:



LED Strip Lights:

- Kitchen
- Pools
- Bathrooms
- Benches or shelves in the home
- Stairs
- General room lighting

Rope Lights:

- Christmas Decorations
- Balconies
- Landscape accenting
- Walkways
- Wrapping around poles or trees

Can You Use LED Strips To Grow Plants?

We all know that plants undergo photosynthesis to produce energy for themse lves. Light is a vital component of this chemical reaction. It is why plant s do not grow well when there is not adequate sunlight. You must have notic ed that some indoor plants grow better than others. And the reason for that is their placement within the house or office. Plants near a source of ligh t grow better because it facilitates the process of synthesis.

Any sane mind would wonder whether a substitute for sunlight, such as LED s trips, can be used to grow plants. And it is precisely what we want to make clear with this guide. So, let’s dive right into it.

Why Do Plants Need Sunlight?



You have to understand the role of sunlight in photosynthesis to know wheth er an alternative like LED can be used as a substitute. It is a process tha t uses water and carbon dioxide, but the plant needs a certain amount of en ergy to initiate the reaction. The energy comes from chlorophyll which trap s sunlight and thus initiates the chemical reactions.

The energy is captured in the form of photons which are units of light. Hence, essentially, any object that emits photons can be used to initiate photosynthesis. Now because LEDs emit photons as well, you can use them as substitutes for sunlight.

So, if you live in a place that does not get much sunlight, LEDs can be great alternatives to grow plants.

Can You Use All Types of LEDs to Grow Plants?

All LEDs emit photons; theoretically, any LED should work. But it is a superficial explanation, and the devil lies in the details. Different LEDs emit light with varying wavelengths. And not all the wavelengths are suitable for growing plants. LED lights we generally use in houses and offices do not have the optimal wavelength to grow plants. And it gets even more complex because plants also have different wavelength requirements.

Luckily, information about the appropriate wavelength for different plants is readily available on the internet. You must consider that and select the suitable LED type for a particular plant; however if there is not enough time to get into details, purchase a white LED. These lights offer a mix of appropriate wavelengths for various plant species.

What Is The Right Way To Use LED Strips To Grow Plants?

You cannot just purchase any LED light, hang it over the plant, and expect it to grow. You must follow a proper technique to ensure plants are getting adequate light. It becomes even more critical if you use LED strips as the sole light source. Failure to consider the following factors will result in stunted growth of the plants and flowers.

The Right Type of LEDs

Pretty much any LED light would do if the plants need supplemental light. But, if the LED is the sole light source, it is an entirely different story. Sunlight offers a complete spectrum of wavelengths, and each wavelength has a role to play. For example, blue light plays a role in plant growth, whereas red light is crucial for flower production. If the plant does not receiv

e either of these wavelengths, it will result in stunted growth or sub-par production of flowers.

The mentioned wavelengths would work for most plants, but there are exceptions. Hence, before purchasing a LED strip, check for the wavelength requirement of the plants online. And ensure that the LED strips you are getting provide the appropriate wavelength for the plants.

Hang The Light at the Appropriate Distance

You should place the LED light near plants to provide the necessary energy without burning them. Just a few inches away from the plant is enough. But do not forget to adjust the height and angle as the plant grows. You can also purchase special light hangers designed especially for this purpose. These hangers will spread the light over the entire area of the plantation.

Do Not Keep Them On All The Time

Respiration is a process just as crucial as photosynthesis, and it does not require light. It does not mean that it happens only when the light is out. You do not have to turn the lights on while the reaction occurs. Hence, it is better to turn off the LED lights for a few hours to save energy, especially if you have multiple plants that use many LED lights. The LED lights will work best if they are turned on for 12-16 hours daily.

Traditional Grow Lights vs. LED Grow Lights: What Are The Differences?

Grow lights are products that are tailored to be used for the indoor-gardening. NASA and several other organizations have been studying them for decades. Traditional grow lights are variations of incandescent or fluorescent bulbs. Such lights are cheaper, but they pose particular risks to the plants. For example, the heat generated by these lights can sometimes be too much for the plants. Hence, the plants can get burned if they are not at the proper distance.

Furthermore, traditional grow lights are also prone to breakage, which leaks mercury, lead, and gasses that can impact plants' growth.

On the other hand, LED Grow lights are expensive to purchase but offer several benefits over traditional lights. You do not have to worry much about their distance from the plant. Even if these lights are installed near the plants, they will not produce significant damage. It is because the heat generation is much less with LED lights, and it does not come at the expense of necessary wavelengths.

Furthermore, LED growth lights are much more rugged and less prone to breakage. And there are no mercury, lead, or gasses in them. Hence, even if they break near the plant, its growth would have little to no impact.

Is it Safe to Leave an LED Strip on Constantly?

As LED strips are getting more and more popular, there is a lot of confusion around how to use them best. The most common question we see is, “is it safe to leave an LED strip on constantly?” Yes, if your led strips are of good quality and installed correctly, no obstacles interfere with heat dissipation.

LED strips, also known as a ribbon of light, come in all shapes and sizes. This type of lighting can be found in retail stores, restaurants, hotels, and homes. LED strip has several valuable features that make LEDs a great option. One of the important features is that they produce very little heat, last up to 10 times longer than conventional lighting bulbs, and consume very little power when in constant use. Unlike incandescent bulbs, LEDs do not generate light through heat. LED strips produce a minimal amount of heat, meaning they are unlikely to overheat and catch fire.

LED strips also have a longer service life and are durable. So led strips can be left standing 24 hours a day, seven days a week.

But, cheap LED strips carry the risk of overheating and can cause fires.

Most LED strips are low voltage 12V or 24V, so they need to work with an LED driver. Please make sure the LED driver is of good quality, and cheaper LED drivers can also cause overheating and lead to fires.

One more thing, ensure that the connections are electrically insulated. Exposed contacts can cause short circuits, which can lead to a fire.

Even though quality LED strips can be on for long periods, it is advisable to turn them off if they are not needed or if you are traveling. This will save electricity and avoid other accidents.

How Can I Stop My LED Strip Lights Reflection in Tiles?

If you are using LED strip lights in your home decor, you might be wondering how can I avoid my Led strip lights reflection in tiles? If you have looked at some home interior photographs, you may have noticed how the led strips reflected in different tile surfaces. If you do not want this problem, then you will have to make sure that the strip lights are installed in the right places, to get an even and clean lighting effect.

Check out some tips below:

- If possible, install the LED strip in a place where there is no reflective surface. By solving the problem at the origin, you can eliminate the reflection problem.

- Choose the latest technology of COB led strip. The density of the lamp beads of the COB led strip is very high. There are 480 chips per meter, or even more. Even if it is not used with aluminum profiles, no light spots will be seen.

- Use silicone neon light strips, silicone neon lights are wrapped with silicone tubes, which can diffuse the light so that the light is uniform, and no light spots can be seen.

- Stick the LED strip into the aluminum profile, and then cover the milky white PC cover. The PC cover can diffuse the light, so the light spots will not be seen.

How to stop my LED strip lights from falling down

LED strip lights are a type of lighting often used in home decoration. They are easy to install and provide a versatile way to add accent lighting to a room. Unfortunately, LED strip lights can sometimes fall down, especially if not installed correctly. This can be frustrating and even dangerous, as the falling LED strip lights can break or cause electrical problems. You can do a few things to prevent your strip lights from falling down.

5 Common reasons why LED strip lights keep falling off

Dust or unevenness on the surface

One of the biggest reasons LED strips to fall is that the surface on which it is installed is dusty or uneven. Because the installation surface is dusty or rough, the 3M double-sided adhesive force on the LED strip will be insufficient or invalid.

Water damage

If you install the LED strip in a place where it may encounter water, you have to consider that the water will destroy the stickiness of the 3M double-sided tape, which will cause the LED strip to fall. Even some wet places will cause the LED strip to fall.

Chemical repels

All LED strips will have 3M double-sided tape on the back, which can make the LED strips stick to the installation surface well. However, some chemicals will damage the stickiness of 3M double-sided tape, and the LED strip will fall off after a long time.

Overheating issues

When the LED light strip is working, it will generate heat. If the LED strip is installed in a narrow, stuffy place, the heat will not be quickly diss

ipated through the air. Excessive heat will damage the stickiness of the 3M double-sided tape, causing the LED strip to fall off.

Wire problem

There will be wires at the ends of the LED strips. If the wire is too long, then the weight of the wire will be high. If the wire is not correctly installed, the wire will fall, which will pull the LED strip and fall.



Instructions: How to keep LED strip lights from falling off

Now that you know some of the reasons why LED strips fall, we'll show you how to prevent LED strips from falling.

Clean your surface

You should start cleaning the surface because dust or dirt on your surface will significantly reduce the adhesion of the 3M double-sided tape.

You can start by dampening a cloth with rubbing alcohol and rubbing it back and forth across the surface once you're satisfied. Dry with a lint-free rag or paper towel.

Apply adhesive

Next, you should use a brand of double-sided tape, such as 3M, and follow the correct instructions to install it. By using this method, you can reduce the chance of LED strips falling in order.

Position in the right place

Now you should have the LED strip in the right place before pressing it. It is not recommended to install the LED light strip multiple times because the viscosity of the 3M double-sided tape will quickly decrease, and the possibility of the LED light strip falling is very high.

Press down

Now that you have the correct position, it's time to apply pressure to your LED strip.

This ensures that the 3M double-sided tape can stick to the mounting surface, reducing the chance of the LED strip falling off.

Let them dry

Follow the specifications and allow the 3M double-sided tape to dry for some time to achieve optimal tack.

Final test

It's a good idea to do a final check to ensure your LED strip is securely mounted in the correct position.

Additional Tips To Prevent Led Strip From Falling Off

3M backing tape

Our LEDYi LED strips are equipped with the most robust 3M double-sided tape, 300LSE. Some factories use fake 3M double-sided tape, which will cause the LED strip to fall off after a period of use.



Foam backing tape

Some waterproof LED strips, such as IP65 and IP67, are heavier than non-waterproof LED strips. We need to use foam tape. Our foam tape is very sticky. This great splash-proof LED tape weighs a little more than regular tape. Note that the installation must be careful. You will have difficulty removing the foam tape if the installation is wrong.



For more information, please check our article How to Choose The Right Adhesive Tapes For LED Strip.

Fixing clips

Fixing clips is also a suitable method. You can attach the LED strip to the mounting surface with screws and clips. But it needs a mounting surface that can support screwing.



Using hot glue

Hot glue does not contain the same harsh chemicals as strong glue, which means it is safer and will not damage your LED strips.

The only thing you need to watch out for is the temperature of the hot glue. If it gets too hot, you could melt your LED strip. But this is unlikely to happen.

Aluminum extrusion

LED aluminum profiles are a perfect way to install LED strips. The surface of the LED aluminum profile is very smooth, and the 3M double-sided tape ca

n be pasted well. And the LED aluminum profile also has a cover, which can contain the LED light strip. Finally, the LED aluminum profile can also help the LED strip to dissipate heat and ensure that the LED strip works at a normal temperature, thereby extending its life of the LED strip.



Corner connector

The edges and corners of the light strip are usually where the LED light strip falls first.

If you try to bend the strip at a 90-degree angle, it will cause it to fall off faster. That’s because there is more air in contact with the stickiness of the strip, and the strip will have more tension from trying to bend backward.

You can cut the strip and get corner LED strip connectors to solve this problem.

I don’t like this solution because cutting the ribbon is annoying. You have to figure out which connector you want to get.

Instead of bending the strip in one direction, you can let it go, turn it in the opposite direction and keep going until it forms a loop.

This will leave the strip free of tension and more flush with the surface. Doing this will help the strip stay on longer without cutting or buying additional connectors.

Can LED Strip Lights Catch Fire?

LEDs are becoming increasingly popular as a source of lighting in both commercial and residential settings. However, there is some concern that LED strip lights may be a fire hazard. This article will explore whether LED strip lights can catch fire and what precautions should be taken to avoid any potential danger.

To save your time, let me give the conclusion first:

LED strips are unlikely to cause a fire. The LED strip is not hot enough to ignite anything. The biggest risk is a short circuit or overloaded circuit. This is usually caused by the way they are mounted, rather than an issue with the LED strips themselves.

How can an incandescent bulb start a fire?

The principle of incandescent light is the thermal effect of electric current. Conduct enough current to the filament (tungsten filament), and the filament will heat up to an incandescent state (3000° C), and the filament will emit light with a warm color. About 10% of the power consumed can be converted into visible warm color light, and the luminous efficiency is low.

Under normal working conditions, the surface temperature of an incandescent lamp is about 180° C. If the incandescent lamp is working, it is very easy to cause a fire if it is close to the flammable material.

Do LED strip lights get hot?

LEDs are called cold light sources because LEDs directly convert electrical energy into light energy. Therefore, the luminous efficiency of LED is relatively high, 30%~50%. Compared with incandescent lamps, the working temperature of LED lamps is very low, generally 30~50 degrees Celsius.

Are LED strip lights too hot to harm you?

The human body feels hot when it touches an object at 40 degrees Celsius. When the temperature exceeds 50 degrees Celsius, it burns your skin.

In most cases, the temperature of the LED strip will not exceed 50 degrees Celsius. However, in some special cases, such as the use of high-powered high-density LED strip lights, or in applications where the ambient temperature is very high. Or the heat dissipation conditions are not good enough. This can cause the temperature of the LED strip to rise to 50 degrees. Normally, there is little chance that our skin will come into contact with the LED strip. But in case of contact, we can take some measures in advance, such as wearing gloves.

In short, it is best to keep LEDs away from easy access. This is safer for you, your children, and your pets.

Is a LED strip light possible to catch fire?

LED strips are unlikely to cause a fire. The LED strip is not hot enough to ignite anything. The biggest risk is a short circuit or overloaded circuit. This is usually caused by the way they are mounted, rather than an issue with the LED strips themselves.

A short circuit is the most likely to cause the LED strip to catch fire. Therefore, as far as possible, please choose to use a low-voltage LED strip and LED driver with short-circuit protection.

High-voltage LED strips refer to LED strips that can be directly connected to 110V or 220V mains, usually without short-circuit protection. However, our LEDYi's high-voltage LED strips have short-circuit protection and lightning protection.

Is it safe to put on the LED strip light all day long?

The working temperature of LED strips is usually not high, between 30 and 50 degrees. So, it is safe to keep the LED strips on all day long. However, if you don't have to, turn off LED strips whenever possible, as this saves on electricity bills and makes LED strips last longer.

Can LED strip light overheat?

For high-power and high-density LED strips, if they are not attached to aluminum profiles, they will overheat. This will speed up the light decay of the LED strip and reduce its life of the LED strip.

How many other fire-related risks with LED strips?

LED strips, especially low-voltage LED strips, are generally very safe. However, we need to find out as much as possible what could be causing the fire. In this way, we can use LED light strips with more confidence.

Here are some factors you need to avoid.

Used low-quality LED strips

Don’t use some low-priced, low-quality LED strips. These LED strips usually use low-quality raw materials, such as very little copper in the FPCB. Because of the use of low-quality LEDs, to make the LED strips brighter, the current of these LED strips is designed to be greater than the rated current of the LED lamp beads. These low-quality LED strips can heat up badly.

Used poor and cheap power supply



LED power is a very important part. We must never use low-quality LED power supplies. The output voltage of low-quality power supplies is unstable, som

etimes higher than the voltage of the LED strip, which makes the LED strip overheat or even die.

The actual wattage of low-quality LED drivers will be lower than the wattage on the label, and the actual wattage is only 80% of the wattage of the label, or even lower.

When we connect the LED strip according to the wattage on the label, it will overload the current and cause overheating.

Low-quality LED drivers generally do not have short-circuit protection. When the wrong installation of the LED strip leads to a short circuit, if there is no short circuit protection, the current of the LED strip will be very large, overheating, and causing a fire.

For detailed information, please read the article How To Choose the Right LED Power Supply.

Wire size unmatched to strip light wattage

Before installing the LED strip or wiring, you must consider the wire that fits the circuit’s rated current value. The higher the power of the led strip, the larger the wire needed to avoid overheating and melting the wire to causing a fire. The amount of current is determined by a variety of factors, including the number and length of light strips. Therefore, before installation, you need to calculate the maximum current on the circuit and confirm the required wire size.

Table 1: American Wire Gauge (AWG) Cable / Conductor Sizes and Properties

AWG	Diameter [inches]	Diameter [mm]	Area [mm^2]	Resistance [Ohms / 1000 ft]	Resistance [Ohms / km]	Max Current [Amperes]	Max Frequency for 100% skin depth
0000 (4/0)	0.46	11.684	107	0.049	0.16072	302	125 Hz
000 (3/0)	0.4096	10.40384	85	0.0618	0.202704	239	160 Hz
00 (2/0)	0.3648	9.26592	67.4	0.0779	0.255512	190	200 Hz
0 (1/0)	0.3249	8.25246	53.5	0.0983	0.322424	150	250 Hz
1	0.2893	7.34822	42.4	0.1239	0.406392	119	325 Hz
2	0.2576	6.54304	33.6	0.1563	0.512664	94	410 Hz
3	0.2294	5.82676	26.7	0.197	0.64616	75	500 Hz
4	0.2043	5.18922	21.2	0.2485	0.81508	60	650 Hz
5	0.1819	4.62026	16.8	0.3133	1.027624	47	810 Hz
6	0.162	4.1148	13.3	0.3951	1.295928	37	1100 Hz
7	0.1443	3.66522	10.5	0.4982	1.634096	30	1300 Hz
8	0.1285	3.2639	8.37	0.6282	2.060496	24	1650 Hz
9	0.1144	2.90576	6.63	0.7921	2.598088	19	2050 Hz
10	0.1019	2.58826	5.26	0.9989	3.276392	15	2600 Hz
11	0.0907	2.30378	4.17	1.26	4.1328	12	3200 Hz
12	0.0808	2.05232	3.31	1.588	5.20864	9.3	4150 Hz
13	0.072	1.8288	2.62	2.003	6.56984	7.4	5300 Hz
14	0.0641	1.62814	2.08	2.525	8.282	5.9	6700 Hz
15	0.0571	1.45034	1.65	3.184	10.44352	4.7	8250 Hz
16	0.0508	1.29032	1.31	4.016	13.17248	3.7	11 k Hz
17	0.0453	1.15062	1.04	5.064	16.60992	2.9	13 k Hz
18	0.0403	1.02362	0.823	6.385	20.9428	2.3	17 kHz
19	0.0359	0.91186	0.653	8.051	26.40728	1.8	21 kHz
20	0.032	0.8128	0.518	10.15	33.292	1.5	27 kHz
21	0.0285	0.7239	0.41	12.8	41.984	1.2	33 kHz
22	0.0254	0.64516	0.326	16.14	52.9392	0.92	42 kHz
23	0.0226	0.57404	0.258	20.36	66.7808	0.729	53 kHz
24	0.0201	0.51054	0.205	25.67	84.1976	0.577	68 kHz
25	0.0179	0.45466	0.162	32.37	106.1736	0.457	85 kHz
26	0.0159	0.40386	0.129	40.81	133.8568	0.361	107 kHz
27	0.0142	0.36068	0.102	51.47	168.8216	0.288	130 kHz
28	0.0126	0.32004	0.081	64.9	212.872	0.226	170 kHz
29	0.0113	0.28702	0.0642	81.83	268.4024	0.182	210 kHz
30	0.01	0.254	0.0509	103.2	338.496	0.142	270 kHz
31	0.0089	0.22606	0.0404	130.1	426.728	0.113	340 kHz
32	0.008	0.2032	0.032	164.1	538.248	0.091	430 kHz
33	0.0071	0.18034	0.0254	206.9	678.632	0.072	540 kHz
34	0.0063	0.16002	0.0201	260.9	855.752	0.056	690 kHz
35	0.0056	0.14224	0.016	329	1079.12	0.044	870 kHz
36	0.005	0.127	0.0127	414.8	1360	0.035	1100 kHz
37	0.0045	0.1143	0.01	523.1	1715	0.0289	1350 kHz
38	0.004	0.1016	0.00797	659.6	2163	0.0228	1750 kHz
39	0.0035	0.0889	0.00632	831.8	2728	0.0175	2250 kHz
40	0.0031	0.07874	0.00501	1049	3440	0.0137	2900 kHz

Poor Installation

Make sure the joints are as tight as possible. Loose connections can result in excessive resistance, severe heat generation, and the potential for sparking. Use soldering instead of solderless connectors.

How to reduce the heat of LED strips?

Excessive heat will shorten the life of the LED, so we need to reduce the heat of the LED strip as much as possible.

Use LED aluminum profiles



Attaching LED strips to aluminum profiles is a great way to reduce heat. Aluminum is a material with good heat dissipation properties and is affordable.

There are many other advantages of using aluminum profiles, you can read the article Ultimate Guide To Aluminum Profile For LED Strip.

Use dimmers and sensor switches

We don't always need LED strips to work at their brightest or all the time. So we can use dimmers and sensor switches. By adding dimmers, we can reduce the brightness, and power of the LED strip, and thus reduce heat generation. Sensor switches can automatically turn off LED strips when no people are there, extending the service life of the LED light strip.

Use branded LED strips

Using brand high-quality LED strips may be more expensive, but they will last longer. The brand's LED light strips can make you more comfortable to use without worrying about fire.

If you want to know more about LED strip brands, please read the following articles:

Top LED Strip Light Supplier In USA

Top LED Strip Light Supplier In Australia

Top LED Strip Light Supplier In UAE

Professional installation

You must find a professional qualified electrician to install the LED strip.

Improper installation may cause the LED strip to not work properly, or even cause a fire.

Can LED Strip Lights Be Hardwired?

It is a fact that LED strip lights are on a roll nowadays. They look appealing and attractive. And generally speaking, they have many applications in our daily life. That's why they are prevalent everywhere. But there is an issue going on with these lights. Can we hardwire these strip lights or not? These lights will become more valuable if we can hardwire them. Many people want to know this.

In simple words, the answer is yes; we can hardwire them. But first, there is something else that we should know. You should understand what the purpose of these LED lights is. You cannot use wire nuts at the ends of the temporary lights. It is suitable only for strip lights.

Moreover, you should keep in mind the steps and safety tips for this process.

Why Hardwire LED Strips Light?

Generally speaking, these are just regular lights. But what makes them distinct is their benefits. They are more luminous and energy efficient. It is simple to hardwire these lights.

You connect these lights to the wiring in your house. But there is an important thing to consider here. The technicians should be professional and experts in this field. They should know what there are doing.

You must be wondering why this hardwiring is essential. Well, it brings a lot of benefits with it. If you do this, you will lessen your cleaning task. You will have fewer wires in your home. You can clean them easily. Moreover, with fewer wires, your space will look less complicated. It will make your house more elegant.

Another advantage that it adds is the steady flow of electricity. But this feature depends on how well you have hardwired the lights. In this post, we will see this hardwiring process. How can you do this in your home with your LED strip lights? And what preventive measures should you keep in your mind while doing this?



Where To Hardwire LED Strip Lights?

Everyone wants to beautify their homes or space. It gives a positive vibe when your room is smooth and polished. Yes, you can install the strip lights in your home. And they will make it more aesthetic. But if you haven’t done it correctly, you probably lag. For this, you will have to hardwire the lights. You can do this for:

- Guest room

- Bathroom
- Kitchen
- Bridges
- Public buildings
- Malls and stores
- Hotels and restaurants
- Concerts and Light Shows
- Other locations

But as we have discussed above, this procedure needs excellent expertise.

Guest Room:

In a guest room, it’s convenient to hardwire your LED strip lights. Your guest room’s roof can have strips installed. If you put LEDs around it, your room will appear completely different.

Assess your roof’s length carefully so you can figure out the number of strips you need.

If you want your guest room to appear more elegant, play around with colors to make it enjoyable. You can do this with the help of modern strips that change color.

Bathroom:

Research has shown that pictures of bathrooms are more famous on social media sites. If you like to follow the latest trends, take selfies in the bathroom. But first, make it photo-friendly by putting in some lovely LED strip lights. It is also a great way to bring your old toilet up to date. After putting in lights, you don’t have to do much work to make your bathroom look nice.

It is a fact that these strip lights create a pleasant atmosphere. But one thing to add here is that their brightness is very beneficial. It increases visibility in your home. It is common to install these lights in bathrooms and kitchens. You can hardwire these lights here, also.

It’s not a tough job to do so. And it does not need the additional connector power source. In fact, we can link these directly to the same wall switch.

Kitchen:

When it comes to the kitchen, it is not an easy task to hardwire. We usually have hot temperatures in our kitchen. This high temperature is unsafe for the LED lights. And the service life of these strip lights gets reduced. So it is necessary to make a band of lights. To do so, we must use the current lighting. Strip lights are a great way to brighten the space under your cabinets. It makes the room look nice and provides an excellent view of the cabinets below.

By putting them underneath the upper cabinets, you can change the whole look of your kitchen. After putting them in, my kitchen is now a well-lit place to work. I also don’t feel any stress because the lights aren’t shining right on me.

For more information, you can read How To Choose the LED Strip Lights For Kitchen Cabinets?

Bridges:

Many designers use LED strips to improve the look of their developments these days. You can find LED lights on bridges all over your state. These lights make the bridge look better. These strip lights use less electricity. They are more productive compared to other types of lighting.

The lights on the Swan Street Bridge in the United States are an excellent example. Engineers use more than just strip lights to make bridges look better. They also use LEDs. You can see this wonder at the Skyway Bridge and Oakland Bay Bridge in San Francisco.

Authorities say they started the work to make the bridge safer and more beautiful. Using LED strip lights to create a bridge has a lot of good points. You can choose various illumination patterns for a bridge with strip lights.

Public Buildings:

LED strip lights are also helpful to light up state buildings. These are important in many public buildings and art museums in your town. Governments use these LED strips all over the world to light their facilities. The best example is when Wollaton Hall is lit up for Celebrations. Any building can become a landmark by adding LED strips to the outside.

Malls and Stores:

In business, there are many ways to use strip lights. These are useful for background lighting in theaters, stores, and shopping malls. Remember that the lights can significantly affect how your attendees feel. Some store owners also put them on their store signs and logos to make them look better. It helps them get more people to come into their shops.

Several studies show that color and lighting affect how we feel. For example, low light from above can help you relax. Evening red light is good for your mental health. It enables the body release melatonin, which helps people sleep better at night.

Hotels and Restaurants:

If you own a guest house or hotel, you can enhance the mood of your place by putting LED strip lights in different areas. You can use these strips on the balcony, in the reception area, by the pool, and in the conference center. Hotel rooms are being lit up more and more with LED strips.

Concerts and Light Shows:

LED strips are strong enough to withstand bad weather. So, you understand how they could be helpful in outdoor concerts and light displays. You may have noticed changing patterns of colors in the light sources at the music event. Most of the time, it’s done with an RGB LED strip light.

You can also use these strips to make your aquarium look nicer. In some waterfalls, waterproof LED lights are helpful to make things look different.

Other Locations:

Apart from the above areas, there are many other locations where you can do this procedure. There are two things that you should keep in mind while hardwiring anywhere.

- Always check the power output of the area.
- Second, test if it is safe to do so.

There are some rules set by UL/CSA. You should always strictly abide by these rules.

How To Hardwire LED Strip Lights?

As discussed above, it is not a difficult task to hardwire. You have to ensure one thing. The strip lights and output power wires are firm. They are securely connected together.

You can either use the wire nuts. Or there is another method of doing so. You can join the ends of all strip lights to the same cables. In this way, you can hardwire and make connections.

Step 1: Get the Material Ready.

First of all, you should have all the material ready. Cut the strip lights according to the length you need. And it is not a straightforward thing to cut these lights. You should have proper knowledge of how to do this. Otherwise, you can end up damaging these lights. It is crucial to use sharp scissors to cut along the rows.

For more information, you can read How to Cut, Connect and Power LED Strip Lights.

Also, you should ensure that the control system is ready. The examples include:

- Dimmer
- Switch
- Bluetooth controller that works without wires.

You must also ensure that you have the following things:

- Correct power adapter
- A/C power cable
- Male barrel plugs

The goal is to use an LED strip:

- Under the control of a dimmer
- A switch
- Bluetooth.

And you should keep in mind one more thing. You should follow all the steps for installing the LED strip lights.

Step 2: Plug the Adapter Into the AC Power.

Clip a wire connector onto the end. Because each case is different, it needs a separate power adapter. You must understand the meaning of the colors. It is necessary to link the AC supply for a three-color strip.

Now, you connect the brown wire first and then the blue wire. The former goes into the adapter's live port. And the latter links with the adapter's neutral power. You connect the standard AC cable to the ground port. The power source needed here should be either 12V or 24V.

Step 3: Plug the Adapter Into the DC Power.

The procedure of plugging the adapter is the same as before. There are two wires; black wire and red wire. Connect the former with V- port and the latter with the V+ port.

Step 4: Light Test

You should do this test to see if everything is working smoothly. If there is no problem, proceed to the next step. Otherwise, try different power settings.



Measuring LEDs Size And Power Supplies:

Measure the Area Where You Plan On Hanging the LEDs:

Try to make a guess at first. You should have an idea of how many strip lights you will need. For different locations, you should estimate each. You should know the length that you need. If the size is not correct, it will create problems later on.

Before you proceed with anything else:

- Plan out the insertion. You should draw a picture of where you’ll put the lights.
- Suppose there are any sockets nearby that you can plug them into.
- You should see where the nearest plug is. What is the distance between the strip lights and the plug?

Test the Voltage Of the LEDs To See What They Need:

The power source for these lights is 12V or 24V. You can check this information on the label or the website where you bought the lights. For effective performance, it is necessary to have the correct power source. Otherwise, the lifespan of the strip lights gets disturbed. And they cannot work correctly in this scenario.

Sometimes, you will have to cut the LED lights into pieces or use more than one piece. You can have the same power source for more than one LED light. The 12V power source is more common. But the lights with 24V are brighter.

For more information, you can read How to Choose The Voltage of LED Strip? 12V or 24V?

Determine the Maximum Power Consumption Of the LED Strips.

Every electronic appliance runs on electricity or power. In the case of these lights, the power depends on the length. The wattage is generally mentioned on the label. You can get it from there. For total power consumption, the formula is as follows:

= watts * full length of the lights

The unit of measurement differs from area to area. So you should not forget to check the unit. It can be watts per foot or watts per meter. We can understand this by taking an example. For instance, we have a strip of 10 feet. The total output current is 24 watts. We can get the power consumption as 24/10 = 2.4 watts per foot.

Estimation Of Minimum Amperes Required:

To find the minimum amperes, we have a formula. We can figure this out by dividing the power by voltage. You must be wondering what the amperes are. It is the unit used to measure the electric current. The electric current moves quickly through the LED strip lights. If it does not move quickly, the lights will go out.

We have a tool called “Ammeter” to measure the electric current. If you don’t have this tool, there is still a method to find it. For instance, the

re are 24V strip lights. They use 240 watts of electrical power. To get the electric current, we apply the formula. Divide 240 by 24. The electric current used is ten amps.

Complementation Of Power Supply And Power Requirement:

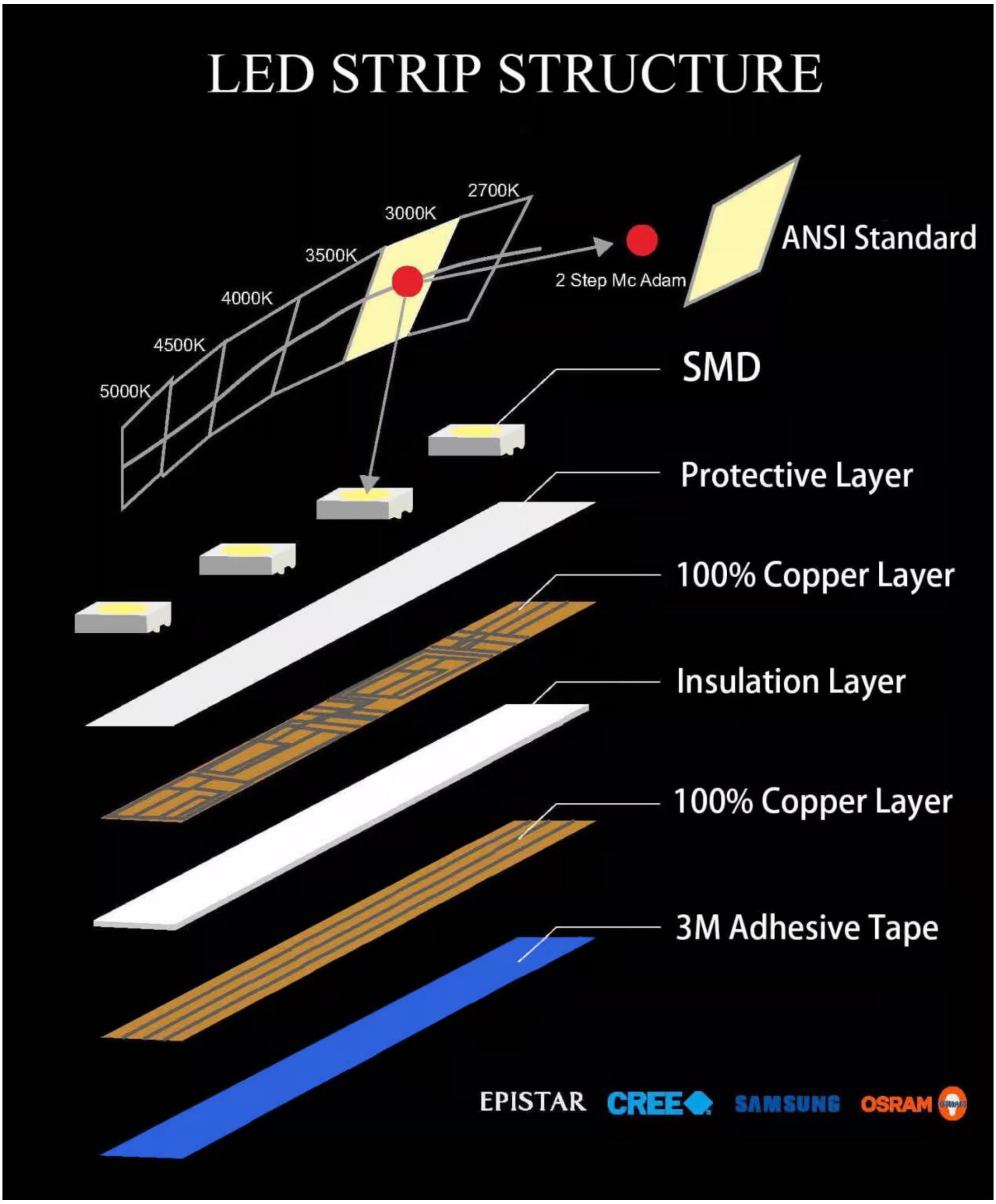
You should have a power source that matches the power requirements. After the above talk, you will have an idea about the correct electricity supply. A brick-style adapter is the most popular type of power source. After linking it to the LED strip, all you have to do to use it is insert it into the wall. There can be another scene of a power source. For instance, you want to provide the energy to each strip light individually. For this, there should be an adapter for each. Each adapter has different power requirements.

For more information, you can read How To Choose the Right LED Power Supply and How to Connect LED Strip to Power Supply.

Do LED Strip Lights Use a Lot of Electricity?

LED strips are more and more popular and are an excellent choice for commercial, residential, and industrial lighting. They are efficient, easy to install and require very little maintenance. You can customize LED strips in various shapes and sizes, so you can use them to light almost any space.

The main components of LED strips are SMD LEDs, FPCB(Flexible Printed Circuit Boards), resistors or other components. LED strips are manufactured by using a process called Surface Mount Technology (SMT) Assembly Process to mount LEDs, resistors and other components onto the FPCB.



A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor. White light is obtained by using multiple semiconductors or a layer of light-emitting phosphor on the semiconductor device.

Most of the power consumed by LED strips comes from the power consumed by SMD LEDs.

LEDs use less electricity and do not get particularly hot. They are illuminated entirely by the movement of electrons in a semiconductor material, and they have a lifespan as long as a standard transistor greater than 50,000 hours. LEDs have several advantages over conventional incandescent lamps, but their main advantage is efficiency. In incandescent lamps, the process of light production involves generating a lot of heat (the filament must be heated to be illuminated). Unless you use the incandescent lamp as a heater, this energy is completely wasted, as a large proportion of the available electricity is not used to produce visible light. Relatively speaking, LEDs produce very little heat. A higher percentage of the electrical energy is used directly to produce light, which significantly reduces the electrical demand.

LEDs output more lumens (or the amount of visible light) per watt than ordinary incandescent lamps. Light-emitting diodes have higher luminous efficiency (the efficiency with which electricity is converted to visible light) than incandescent lamps. A 60-watt incandescent lamp can produce 750-900 lumens, but you can get the same output from an LED bulb that uses only 6-8 watts.

YOU USED TO BUY — CONSIDER

LEAST EFFICIENT → MOST EFFICIENT

	Incandescent	Halogen	CFL	LED
450 lumens	40W	29W	9W	7W
800 lumens	60W	43W	14W	10W
1,100 lumens	75W	53W	19W	17W
1,600 lumens	100W	72W	23W	20W

How do I calculate the power consumption of an LED strip?

Before you can calculate the power consumption of an LED strip, you need to know the power per meter of the LED strip and how many meters of LED strip there are.

Common LED strips are available in 2.4W/m (0.73W/foot), 4.8W/m (1.46W/foot), 7.2W/m (2.19W/foot), 9.6W/m (2.93W/foot), 14.4W/m (4.39W/foot), 19.2W/m (5.85W/foot), 24W/m (7.32W/foot) etc.

For example, if there is a 5m LED strip with a power of 14.4W/m (1.46W/foot) and it works 12 hours a day, 365 days a year, how much electricity is used in a year?

The calculation is 14.4*5*12*365=315.360 KW.h

Conclusion

LED strips are very efficient and use less electricity than incandescent, halogen, and fluorescent lamps.

How Long Do LED Strip Lights Last?

Ever wondered about the lifespan of your led strip lights? Understanding their longevity is not just a trivial pursuit, but a crucial aspect that can influence your lighting decisions. LED light strips are more than just luminous decor; they invest in sustainable and efficient lighting applications.

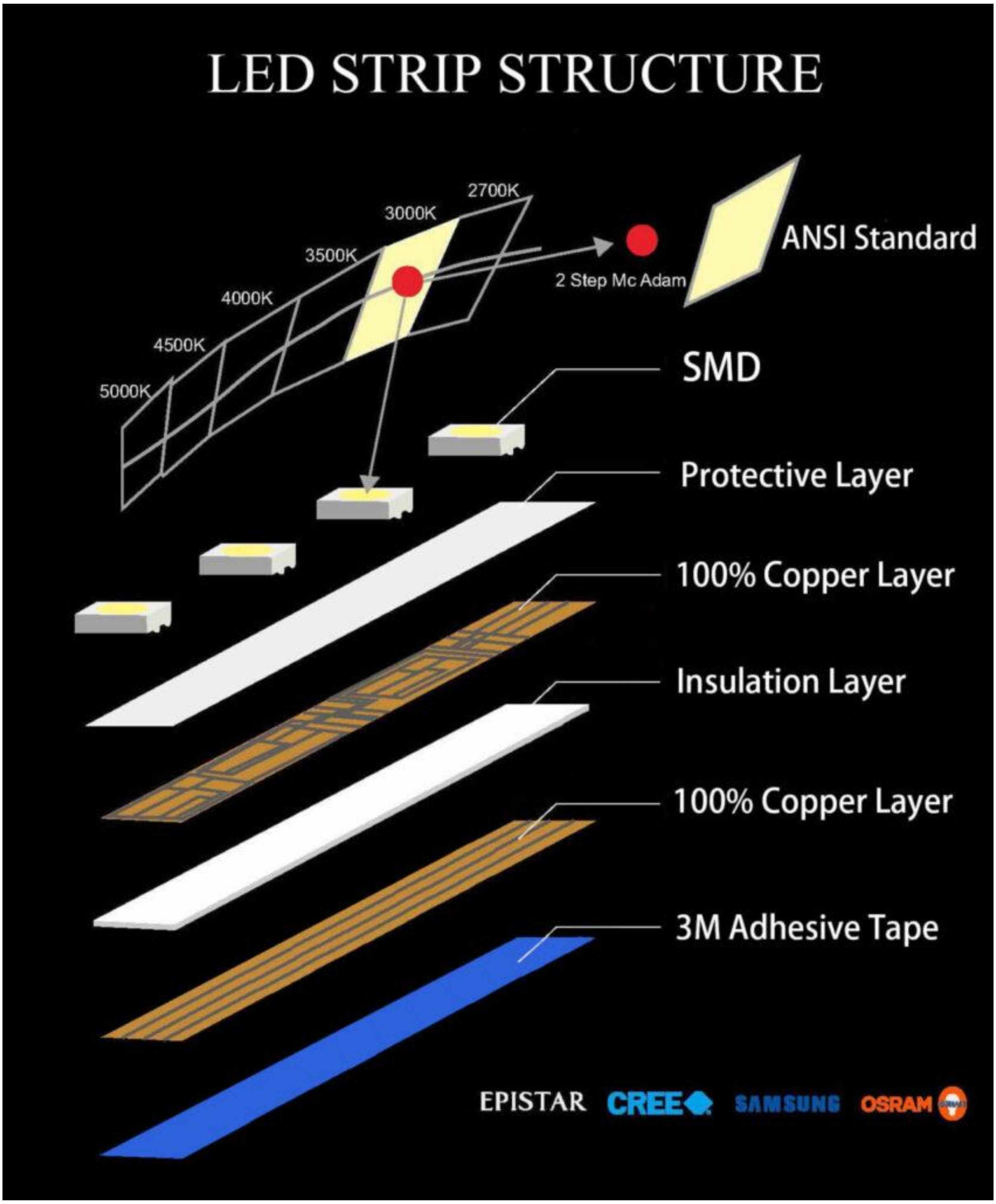
Typically, LED strip lights have a lifespan ranging from 4 to 6 years. However, if you check the product packaging, many makers indicate the expected life duration in hours instead. Most LED items in the industry boast a standard life expectancy of around 50,000 hours.

Factors such as usage patterns, quality from the led strip supplier, and environmental conditions can significantly impact the lifespan of these led products. This blog post aims to provide insightful information on what affects led strip light’s lifetime and how you can maximize it.

So, if you’re interested in getting the most out of your led strip lights or simply curious about the world of LED lighting, this post promises to shed some light on your queries. Stick around for illuminating insights!

The Structure Of The LED Strip

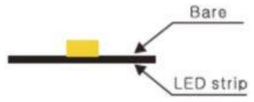
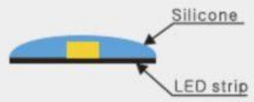
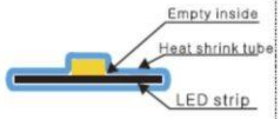
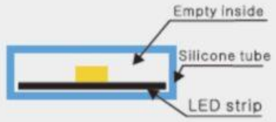
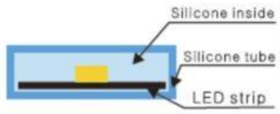
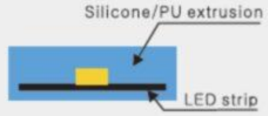
The main components of LED strips are LEDs, FPCB(Flexible Printed Circuit Boards), resistors or other components. LED strips are manufactured by using a process called Surface Mount Technology (SMT) Assembly Process to mount LEDs, resistors and other components onto the FPCB.



Some outdoor or underwater LED strips will be wrapped with silicone or PU glue.

Please note that LED strips with high IP ratings will have a shorter lifetime than IP20 led strips because high IP ratings led strip cannot dissipate the heat faster. In general, the cooler the environment, the higher an LE

D’ s light output will be. Higher temperatures generally reduce light outpu t. Please check here, [How are LEDs affected by heat]?

<table>
<tr><th>IP Rate</th><th>Structure</th><th>Description</th><th>Application</th></tr>
<tr><td>IP20</td><td></td><td>Non-waterproof</td><td>Indoor use</td></tr>
<tr><td>IP52</td><td></td><td>Silicone coating</td><td>Damp environments
e.g. kitchen, bathroom</td></tr>
<tr><td>IP65H</td><td></td><td>Heat shrink tube</td><td>Semi-outdoor raining environments
e.g. porch, eaves</td></tr>
<tr><td>IP65</td><td></td><td>Silicone tube</td><td>Semi-outdoor raining environments
e.g. porch, eaves</td></tr>
<tr><td>IP67</td><td></td><td>Silicone filling</td><td>Outdoor use</td></tr>
<tr><td>IP67E/IP68</td><td></td><td>Silicone/PU extrusion</td><td>IP67E: Outdoor use
IP68: Under water within 2 meters deep.</td></tr>
</table>

The most critical component of the LED strip is the SMD LED. The life of th e SMD LED essentially determines the life of the LED strip. Then, how to ca lculate the lifetime of LEDs?

LED Lifetime And The 70% Rule (L70)

Unlike incandescent bulbs that burn out and fluorescent bulbs that start to flicker, LEDs behave differently over time, slowly and gradually losing lig ht output. So unless there is a “catastrophic” failure caused by a power surge or mechanical damage, you can expect the LEDs on your LED strip to wo rk until they are deemed too dim to use.

But what does “too dim to use” mean? Well, different lighting application s have different answers. However, the industry has somewhat arbitrarily de cided that a 30% loss of light, or the remaining 70% of light, should be th

e standard. This is often referred to as the L70 metric and is defined as how many hours it takes for an LED to reduce to 70% of its original light output.

Sometimes, you can see the symbol LxByCz (h) describe the lifetime of LED. It means the number of hours after which, from a group of LED luminaires:

• the luminous flux has dropped to x (%),

• y (%) of luminaires in the same group have dropped below the specified luminous flux,

• z (%) of luminaires in the same group have experienced total LED failure

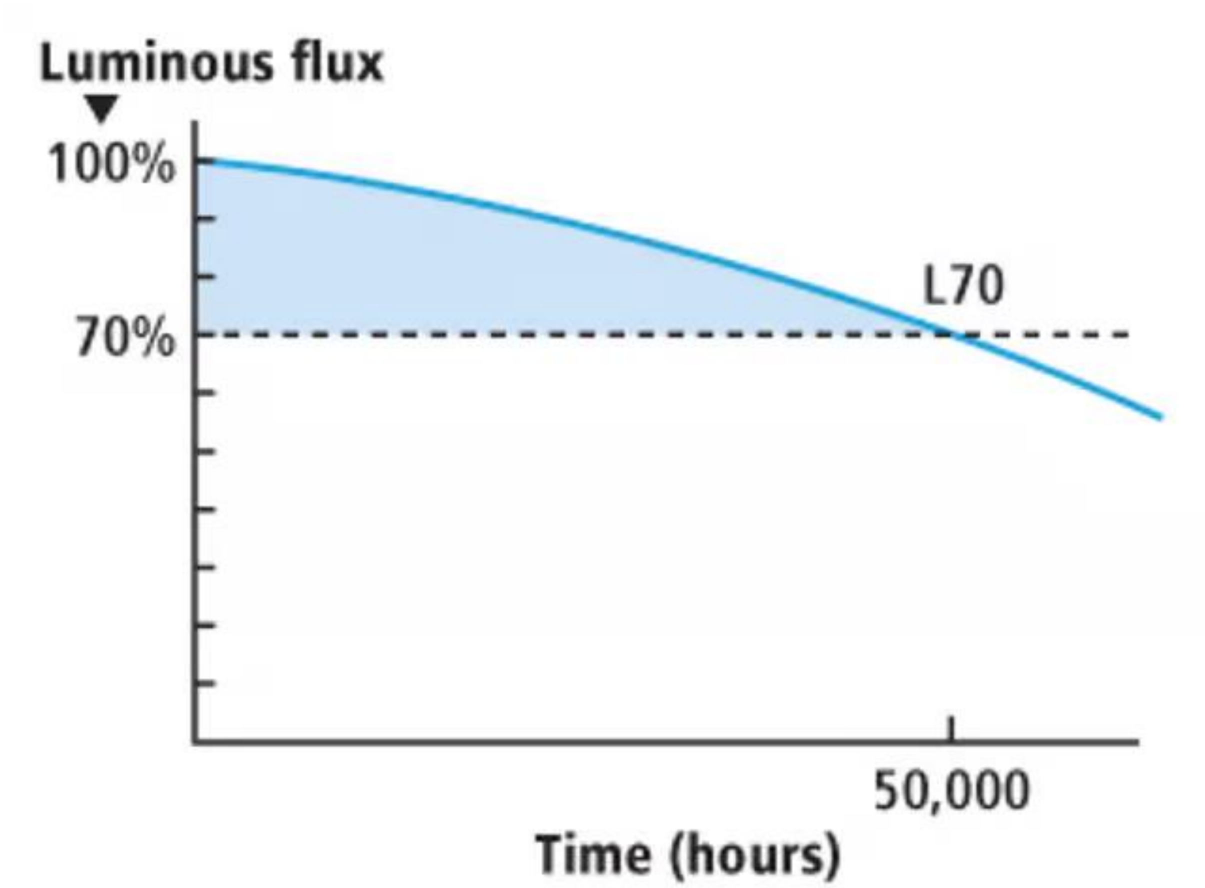
Example: L70B10C0.1 (50,000 h)

• after 50,000 hours, the group of LED luminaires in question must still provide

• at least 70% of the initial luminous flux,

• whereby 10% of the luminaires are permitted to provide less than 70% of the initial luminous flux,

• and in 0.1% of the luminaires, all LEDs may have failed.



How Is L70 Calculated?

Since the choice of LED material varies widely between different types and manufacturers, a test method called LM-80 was developed to specify the primary standard for light lifetime testing. LM80 specifies that the sample is tested at a predetermined temperature and driving current. The time interval for measuring the light output change is 1000 hours, up to a maximum of 10000 hours.

LM-80 testing is usually performed at a third-party laboratory to ensure objective results, and the results are published in a report format. All reputable manufacturers perform this test for their LED lamps, and reputable LED strip suppliers should all be able to provide LM80 test reports, especially if you are buying in large quantities.

The difficulty with LED life testing is that it takes a long time. Even if the led lights are on 24/7, a 10,000 hour test takes about 14 months. This is an eternity for fast-moving industries such as LED lighting. Testing a p

roduct for the complete 50,000 hour requirement, in turn, requires nearly six years of continuous testing.

For this purpose, the TM-21 extrapolation algorithm is proposed. This algorithm considers the performance of the LM80 sample for the first few thousand hours and outputs an estimated lifetime.

TM-21-11 report: Projecting long term lumen maintenance of LED light source

Please check the full LM80 test report here.

Test Condition 1 - 55° C Case Temp	
Sample size	15
Number of failures	0
DUT drive current used in the test (mA)	60
Test duration (hours)	9,000
Test duration used for projection (hour to hour)	4,000 - 9,000
Tested case temperature (° C)	55
α	5.705E-06
B	1.009
Reported L70(9k) (hours)	>50000

Test Condition 2 - 85° C Case Temp	
Sample size	15
Number of failures	0
DUT drive current used in the test (mA)	60
Test duration (hours)	9,000
Test duration used for projection (hour to hour)	4,000 - 9,000
Tested case temperature (° C)	85
α	6.126E-06
B	1.010
Reported L70(9k) (hours)	>50000

Test Condition 3 - 105° C Case Temp	
Sample size	15
Number of failures	0
DUT drive current used in the test (mA)	60
Test duration (hours)	9,000
Test duration used for projection (hour to hour)	4,000 - 9,000
Tested case temperature (° C)	105
α	5.845E-06
B	1.004
Reported L70(9k) (hours)	>50000

LM80 test reports generally give the lifetime of L70. However, sometimes we need to know the lifetime of L80 or L90. Don't worry, and I have prepared an excel tool for you. This tool can convert L70 lifetime to L80 or L90 lifetime. Please click here to download it.

Factors Impacting LED Strip Lights Longevity

1. FPCB(Flexible Printed Circuit Board)

High-quality, 2-4 oz double-layer pure copper flexible PCBs ensure the smooth passage of significant current, reduce heat generation and help the heat to dissipate more quickly. Heat can affect shortening the life of LEDs, so we need to find ways to dissipate it. By attaching the LED strip to the aluminum profile, we can dissipate as much heat as possible and reduce the working temperature. For more information about FPCB, you can read Everything You Should Know About FPCB.

2. Double-sided Tape

At LEDYi, we use 3M brand VHB tape. But, many suppliers offer no-name or, worse, fake brand name adhesives. The key to a long-lasting installation and thermal conductivity is a great quality tape. For information about Double-sided Tape, you can read How to Choose The Right Adhesive Tapes For LED Strip.

3. Resistors

The resistors are used to regulate the forward current through the LEDs so that the LEDs operate at the designed brightness. The value of the resistor may change from batch to batch. Use a reputable company for resistors.

Please ensure that you use high-quality resistors. Low-quality resistors may shorten the life of the LED strip or even damage it.

Do not overpower your LEDs! They will appear brighter at first but will fail fast. We know a few of our competitors that do this. The excess heat may also be dangerous if installed on flammable materials.

4. Power Supply

The power supply is also a crucial part. You must make sure to use a brand-name, quality-assured power supply. A bad quality power supply may output an unstable voltage that may be higher than the working voltage of the LED strip, thus burning the LED strip.

And make sure that the power of the LED strip does not exceed the rated maximum capacity of the power supply. To ensure that the voltage can work more stable for a more extended period, we generally recommend that the power of the LED strip should not exceed 80% of the rated maximum capacity of the power supply. For more information about power supply, you can read How To Choose the Right LED Power Supply.

5. Heat Dissipation

The heat will significantly shorten the lifetime of the LED. So when we use LED strips, we have to find a way to dissipate the heat in time. Try to install the LED strip in a well-ventilated place. The LED strip sticks to the

aluminum profile if the budget allows it. Aluminum is an excellent heat dissipation metal that can be timely LED strip heat dissipation out to extend the life of the LED strip. For information about LED heat sink, you can read LED Heat Sink: What Is It and Why It’s Important?

6. Daily Usage and Durability

Now let’s talk about daily usage. It’s simple math: The more you use something, the quicker it wears out.

- Picture this: You have two pairs of sneakers. One pair you wear every day for jogging, while the other one only sees daylight during weekend hikes.
- Which one do you think will wear out first? Exactly! The same principle applies with LEDs as well.

So if you plan to have those LED strip lights on 24/7 – maybe think again?

7. Electrical Currents’ Impact

Lastly but certainly not leastly (I know that’s not a word but hey) – electrical currents. These invisible forces can play quite a role in determining how long your LED strip lights last. Higher current levels mean brighter light output from your LEDs – great right? Not so fast! While brighter may seem better initially; over time higher currents can lead to faster degradation of LED components – sorta like running at full speed all the time – sooner or later you’re gonna burn out!

So there ya have it folks! Just remember these factors next time you wonder “how long do led strip lights last?” And always remember – treat ‘em right and they’ll light up your life for quite some time!

Role of Power Supply in LED’s Lifespan

Stable Power and LEDs

LED strip lights are like the marathon runners of the lighting world. They can keep going and going, but only if they have a steady supply of energy. The power supply is their lifeline, their secret sauce to longevity.

A stable power supply is not just important for LEDs, it’s crucial. It’s like bread to butter or wheels to a car. Without it, things just don’t work right. You see, LEDs thrive on consistency. Feed them with a steady diet of stable power supply and they’ll shine bright for years.

But what happens when that power supply starts fluctuating? Imagine trying to run a marathon while someone keeps changing the gravity level. One moment you’re light as a feather; the next you’re heavy as lead. That’s what an unstable power supply does to an LED strip light.

Fluctuating Power: A Light’s Worst Nightmare

Fluctuating power supplies are like kryptonite to LED lights. They wreak havoc on their life expectancy, chopping it down faster than a lumberjack with an axe.

The correlation here is simple: quality power supplies equal longer lifespans for your LEDs. It’s like comparing fresh organic produce with fast food – one clearly leads to better health outcomes than the other.

Overdriving the LEDs with high voltage is another way we often unintentionally damage them. Think about it like this: your LED light is a small boat in calm waters (stable voltage). Suddenly, a huge wave (high voltage) comes crashing in from nowhere! This overdrive can cause serious damage leading to reduced lifespan or even immediate failure!

Here are some tips:

- Always use quality power supplies designed for LED lights.
- Avoid exposing your LEDs to high-voltage surges.
- Regularly check your lighting setup for any signs of instability or fluctuations.

So if you’ve been wondering “how long do led strip lights last?”, look no further than your power supply situation! Remember folks, treat those LED strip lights right and they’ll return the favor by lasting longer and performing better!

Effect of Heat on LED Strip Lights

LEDs, like any electronic device, generate heat. But don’t mistake them for your old incandescent bulbs that could double up as mini heaters! LEDs are much cooler. However, they’re not entirely immune to the laws of physics. Let’s dive into how heat impacts these little light wonders.

The Heat Generation in LEDs

LEDs produce light by a process called electroluminescence. It’s a fancy term for saying that when electricity passes through a material (in this case, a semiconductor), it emits light. As cool as it sounds, this process isn’t 100% efficient. Some energy inevitably gets lost as heat.

Now, you might think, “So what? All electronics get hot.” Well, here’s the kicker – unlike other electronics where heat is just an inconvenient byproduct; in LEDs, it can directly affect their performance and lifespan.

Heat: A Light Dimmer and Color Changer

Excessive heat negatively impacts an LED strip light’s output and color quality. It’s like running a marathon in scorching weather – you’ll tire out faster and probably won’t perform at your best.

Too much heat can cause an LED to dim prematurely or alter its color rendering index (CRI). Over time, you might notice your bright white lights turning yellowish or even reddish – not exactly what you signed up for!

The Lifesaver: Proper Heat Dissipation

The key to extending the lifespan of your LED strip lights lies in proper thermal management or more specifically – effective use of a heat sink. Think of it as the AC unit for your LEDs.

A good heat sink absorbs excess thermal energy from the LED chips and dissipates it into the surrounding environment. This keeps operating temperatures low and ensures consistent light output and color quality over time.

Here are some popular types of heat sinks:

- Aluminum extrusion

- Stamped metal
- Cast metal

Each has its pros and cons but remember - anything beats letting your LEDs cook themselves to death!

High Temperatures = Shorter Lifespans

The relationship between higher operating temperatures and shorter lifespans is straightforward - hotter equals shorter lifespan. Just imagine leaving ice cream out in summer; we all know how that ends!

In fact, for every 10° C increase in temperature at the junction (the part where electricity enters), an LED's life expectancy drops by about half! So if you want those strip lights to last longer than your latest diet plan did, keep 'em cool!

The Influence of Daily Usage on Lifespan

Ever wondered about the exact lifespan of your LED strip lights? It's a common question, and one that doesn't have a simple answer. Several factors come into play, but let's focus on the influence of daily usage.

Hours Used Per Day

Imagine you've got a high-quality LED strip light. Most lifetime claims for such lights hover around 50,000 hours. But here's the kicker - if you keep it on 24/7, that's just over five years! On the other hand, use it for an hour every day, which could last more than a century!

So, there's a direct correlation between hours used per day and overall lifespan. More exposure to power shortens their useful life. And less time spent glowing means they'll stick around for a long time.

Switching Frequency

Now think about this - how often do you flip your lights on and off? Continuous testing has shown that frequent switching can affect longevity as well. It might seem trivial, but every time you flick that switch, there's an

instant power surge which puts stress on the internal components of LED strip lights.

That said, LEDs are pretty resilient compared to traditional bulbs. Still, if you're turning them on and off like a disco strobe light all day long - expect some impact on their lifespan.

Prolonged Use Without Breaks

Letting your LED strip lights run continuously for extended periods is another factor to consider. Just like us humans need breaks from work to function optimally, so do these lights! Extended period of usage without any break can cause overheating issues which can shorten their life expectancy.

It might be tempting to leave them running all night for that cool ambient effect or because you're too lazy to turn them off (guilty as charged!). But remember - moderation is key!

Usage Patterns: Continuous vs Intermittent

Lastly, different usage patterns also influence how long LED strip lights last. Continuous use vs intermittent use - each has its own implications.

Continuous use can lead to faster wear-out due to constant exposure to electricity and heat generation whereas intermittent use allows for cooling down periods which may extend their lifespan.

However, don't take this as gospel truth! Other factors like quality of the product and operating conditions (like exposure to sunlight) also matter big time in determining how many years these lights will serve you faithfully!

So yes - how long do led strip lights last? Well…it depends! But now at least we know what it depends upon.

Understanding Electrical Currents in LEDs

LED strip lights are a popular choice for many, thanks to their energy efficiency and long lifespan. But ever wondered what's going on under the hood? It's all about electrical currents.

Picture an LED as a one-way street. The electrical current, like traffic, flows from the positive end (anode) to the negative end (cathode). A semiconducting element within each LED bulb regulate this flow. When voltage is applied, electrons move through this semiconductor, creating light in the process.

But here's where things get interesting. The brightness of an LED isn't just about how much electricity you're putting into it - it's also about how that electricity is managed.

Drive Currents: A Balancing Act

Drive currents play a vital role in determining both brightness and longevity of your LEDs. High drive currents can make your LEDs brighter but at the same time, they generate more heat. And as we know, heat and electronics don't mix well.

Running your LEDs at high drive currents without proper heat management can lead to premature failure of the bulbs or even complete system breakdowns. So while cranking up that remote control might give you more light now, it could mean less light down the line.

Importance of Optimal Current Levels

Maintaining optimal current levels is crucial for maximizing the lifespan of LED strip lights. It's like taking care of a car - sure you can redline it on every trip but doing so will wear out your engine quicker than if you drove at moderate speeds.

So how do you maintain these optimal current levels? That's where resistors come into play. These little components help regulate current flow within an LED system, ensuring it doesn't go overboard.

Risks Associated with Max Rated Current

While running LEDs at their max rated current may seem like a good idea for maximum brightness, remember there's no such thing as free lunch in physics! Doing so increases temperature within each bulb which can shorten its life expectancy significantly.

Tips to Extend LED Light Strip Lifespan

Proper Installation Techniques

First off, let’s talk about the installation process. It’s a no-brainer that proper installation techniques can make or break your LED strip lights’ lifespan. You might be thinking, “How hard can it be? I just stick them on and plug them in!” Well, there’s a tad more to it than that.

1. Clean the surface: Before you slap on those strips, make sure the surface is clean and dry. Any dust or moisture can mess with the adhesive and cause early failure.

2. Avoid twisting and bending: LED strips are flexible but not invincible! Over-bending or twisting can damage the circuits and shorten their life.

3. Use clips for support: If you’re installing long strips, use mounting clips every few feet to relieve tension and prevent sagging.

Regular Maintenance

Next up is regular maintenance. Yeah yeah, I know what you’re thinking – “Maintenance? For lights?” But hear me out:

- Dusting: Over time, dust accumulates on the strip which can cause overheating and reduce brightness. A quick wipe down every month goes a long way!

- Check connections: Loose connectors are an LED strip’s worst enemy. Make sure all connections are tight and secure.

Appropriate Power Supplies

A third crucial point is using appropriate power supplies. It’s like feeding your pet – give ’em too much or too little food, they won’t last long!

- Voltage matching: Always check that your power supply matches your LED strip’s voltage requirements.
- Overload prevention: Don’t overload your power supply by connecting too many strips together.

Controlling Temperature

Lastly, we’ve got temperature control – an often overlooked aspect of prolonging LED lifespan.

- Heat dissipation: LEDs produce heat; if not managed correctly this can lead to premature failure. Consider using aluminum profiles for better heat dissipation.
- Room temperature: Try to keep room temperatures below 25°C (77°F). Higher temperatures increase wear-and-tear on LEDs.

So there you go! Four simple yet effective tips to extend your LED light strip lifespan. Remember folks – treat ’em right, they’ll light up your life longer!

Do LED Strip Lights Attract Bugs?

Turn on the outdoor lights after sunset, and dozens, if not hundreds, of flying bugs, will gather in unison. The lights attract moths, flies, giant mosquitoes, mayflies, beetles, and all sorts of bugs. Frogs and other bug-feeding critters will be waiting at the door to feast on them. Bugs are attracted to light called phototropism.

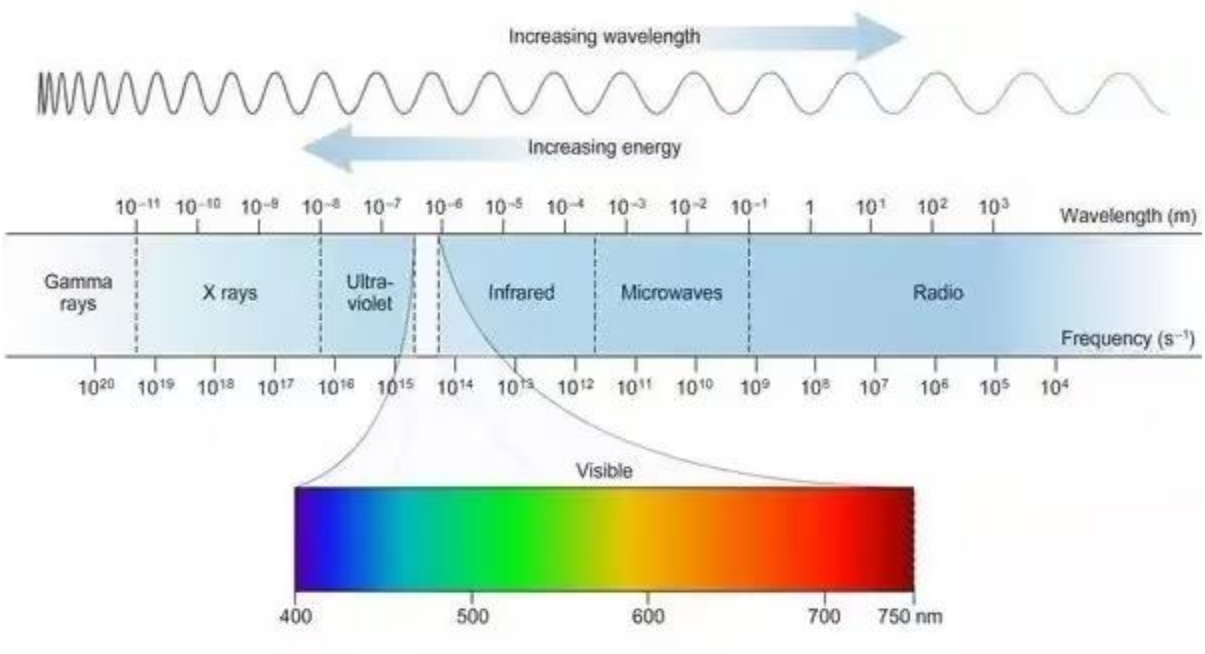
Most bugs have phototaxis, but some have positive phototaxis, and some have negative phototaxis. Simply put, positive phototaxis means that some bugs will actively approach the light source. On the other hand, negative phototaxis is the opposite, with bugs actively moving away from the light source.
A typical example of positive and negative phototaxis is that many flying bugs gather around street lights at night. And these flying bugs are all pos

itive phototaxis. In contrast, our common snails, watermelon bugs, and other animals are negative phototaxis.

There have been many studies on the correlation between light and bug presence. Marianne Shockley Cruz and Rebecca Lindner from the University of Georgia’ s Department of Entomology wrote in a research paper titled “Insect Vision: Ultraviolet, Color and LED Light “. The experimental work supports the existence of color perception in bugs, And bugs are susceptible to the shorter wavelengths of visible and ultraviolet light.” Wavelengths are measured in nanometers, and shorter light waves (less than 550 nanometers) can represent ultraviolet (UV), blue, or green. Cruz and Lindner also cite work demonstrating a relationship between ultraviolet light from the sun and moon and how specific bugs navigate Earth. Another thing to remember about bugs is that specific bugs, like mosquitoes, are attracted to heat and have thermoreceptors to help them find it. All of this information helps determine why bugs flock to particular light sources.

Wavelengths and color temperature:

The color of the light source is important because it attracts bugs. As mentioned earlier, shorter wavelengths (ultraviolet, blue, and green) are more visible to bugs than longer wavelengths (yellow, orange, and red). It is important to remember that most bugs cannot see the light in the range of 650 nanometers (yellow). Bugs use the ultraviolet and infrared light spectrum to navigate and locate food. Since different bugs can see different wavelengths of light, and many are attracted to heat, bug lights are never 100% effective. Still, they reduce bug populations by excluding most bugs’ light.
Ultraviolet radiation from incandescent, compact fluorescent (CFL), halogen, and high-intensity discharge lamps is attractive to bugs. Since some bugs navigate by ultraviolet light from the sun and moon, a closer, brighter ultraviolet light source can disturb the direction of bugs and attract them.
LEDs produce very little or no UV light, making them less visible to bugs.
However, LEDs can still have shorter light wavelengths (blue-white/cool white), which are more attractive to bugs. Therefore, when choosing LED strips, it is important to choose LED strips that emit more light at wavelengths above 550 nanometers, such as warm white, super warm white, or yellow.



Heat

Most of the energy (up to 90%) consumed by incandescent, halogen, CFL, and HID light bulbs is heat. Bugs with thermoreceptors can feel the heat released by these light sources. LED strips generate very little heat, making them less attractive to bugs.

What kind of bugs do led strip lights attract, and what kind of bugs do led strip lights don' t attract.

1. LED Strip Lights Can Attract Spiders

Spiders are attracted to LED strip lights as this is an excellent place for them to forage at night. Spiders eat other bugs and bugs that are attracted to LED strip lights. So, if you have other bugs around your led strip lights, you should know that these bugs may be a food source for spiders, and they will join you.

How To Get Rid Of Them:

One of the most effective ways to get rid of them is to put a chemical called DEET around your LED strip lights or anywhere else. This product is so effective that you can spray it around or buy a repellent that contains DEE

T.
Another way to get rid of spiders is to place sticky traps near your LED strip lights, where spiders often haunt.
A chemical-free way to get rid of spiders is to place natural items like grapefruit peel, peppermint oil, or cinnamon around lights.

2. LED Strip Lights Can Attract Wasps/Hornets

Wasps and Hornets are also attracted to LED strip lights because they provide a good food source. Wasps/Hornets can catch other bugs and bugs, especially those attracted to LED strip lights. So, if you have wasps or hornets near your LED strip lights, you should know that they can catch other bugs. Just like spiders, wasps and Hornets eat other bugs attracted to LED strip lights. So if you have other bugs around your led strip lights, don't be surprised to find wasps and Hornets on them as well.

How To get rid of them:

You have many ways to kill wasps and hornets or drive them out of your led strip lights. One of the most effective methods is DEET. Another effective way to kill wasps and hornets is to spray with permethrin, which can be found in repellents. If you don't want to use chemicals, you can place sticky traps around to catch them. Another chemical-free method is to kill wasps and hornets with water or vinegar. This method works by putting water or vinegar in a spray bottle and spraying wasps and hornets.

3. LED Strip Lights Can Attract Bees

It's rare for bees to be attracted to LED strip lights, but it's also possible because these lights sometimes trigger phototactic responses on the bee's front.
The phototaxis response of bees refers to the tendency of bees to orient themselves in the direction of a light source.
So if you have bees wandering around your led strip lights, chances are it's because of the lights.

How To Get Rid Of Them:

You can turn off the lights for a while for bees and see if they go away.
If the bees still don't leave, then you can try spraying them with water o

r blowing them away with a fan.
I don’t recommend killing bees with chemicals because bees are essential for pollination. If you need to remove them because you are allergic, spray with water or use a fan, and they will go away.

4. LED Strip Lights Can Attract Flies

LED strip lights can also attract flies and other bugs such as moths. This is because these bugs are usually attracted to bright lights. The navigation system also gets messed up when close to the LED strip. This is because they mistook the lights for sunlight or moonlight and started flying towards them. This means they end up being attracted to the light.

How To Get Rid Of Them:

There are many ways to get rid of flies hanging from your LED strip lights. One of the most effective methods is to use fly traps near these bugs, as they are attracted to light. Another effective method is to use tape, which will have the same effect as a flytrap since flies are attracted to glowing objects.

5. LED Strip Lights Can Attract Centipides

If you see centipedes around your led strips, they are probably there for several other existing bugs. Centipede, similar to spiders, are attracted to LED lights because their prey is readily available.
In this case, the centipede will seek out other bugs attracted to the LED light. This is because they eat a lot of bugs and other bugs.

How To Get Rid Of Them:

Centipede bites can be painful, so getting rid of them safely and effectively is important.
There are plenty of ways to get rid of those centipedes dangling around your LEDs.
One of the most effective methods is to use borax powder, which kills centipedes because it interferes with the centipede’s exoskeleton. You can also use diatomaceous earth or sodium borate, which works similarly to borax.
Another effective method is to use traps that you can create yourself or bu

y online. One of the most effective ways to get rid of centipedes is to use a glue trap.

6. LED Strip Lights Can't Attract Cockroaches

LED strip lights are unlikely to attract cockroaches. This is because cockroaches are usually attracted to damp and dark places, which makes LED lights not a good choice for them.

7. LED Strip Lights Can't Attract Bed Bugs

Bed bugs are unlikely to be attracted to LED lights or any other type of light, as they are usually found in dark places. They like to hide in beds, clothes, sheets, curtains, and other dark places.

8. LED Strip Lights Can't Attract Ants

Ants are attracted to UV light, which LED strip lights do not produce. Ants are generally attracted to food, water, and warmth, which is why they may not be attracted to LED lights because the heat of the light is not enough to attract them.

Summarize:

Because different types of bugs see different wavelengths, there is no guarantee LED strips won't attract them. However, most bugs are attracted to short wavelengths of light, incredibly UV light; they can see better, and some use UV light to navigate. LED strips that emit shorter wavelengths of light (cool white/light blue) will attract more bugs. Emits the longer wavelengths of light (yellow/orange/red) less visible. The heat can also attract bugs to one spot. LED strips produce little or no UV light, have minimal heat and don't attract bugs as long as they emit longer wavelengths of light.

How to Choose LED Strip Color Temperature?

Lighting plays an essential role in all architectural spaces. Its primary function enables us to see, but it also greatly influences the aesthetics and ambiance.

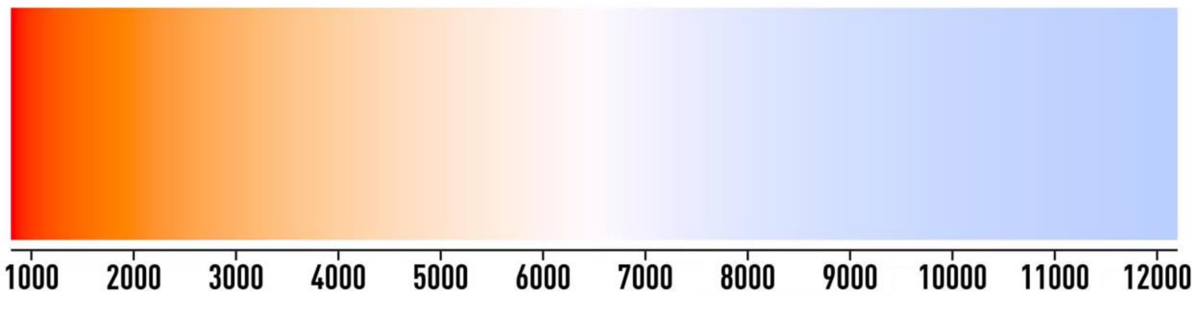
This is why the color temperature of your lighting is an important consideration. What kind of ambiance do you want your space to have? Do you want the home to look warm and welcoming or cold and formal? Also, what sort of CCT will help you achieve your desired effect?

The article will help you choose the correct CCT for your LED strip light.

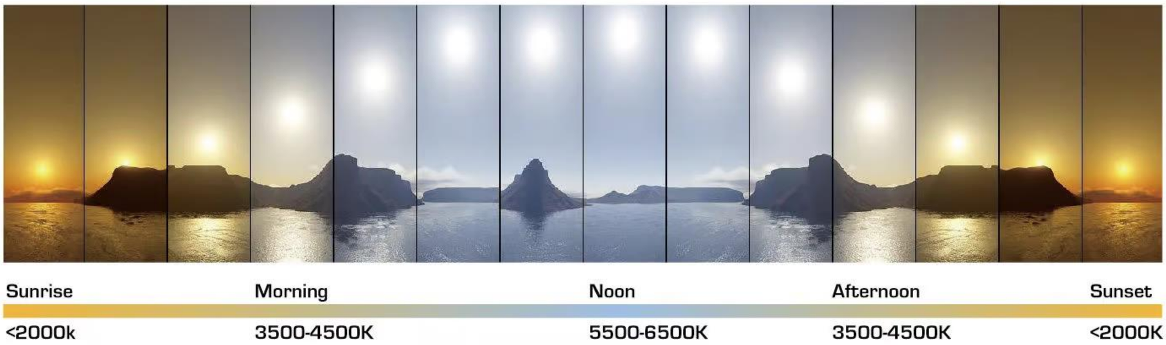
What is the color temperature?

Color temperature is a unit of measurement that indicates the color component contained in light. Theoretically, the blackbody temperature refers to the color of an absolute blackbody after it has been heated from absolute zero (-273° C). When heated, the blackbody gradually changes from black to red, turns yellow, glows white, and finally emits blue light. When heated to a specific temperature, the spectral composition of the light emitted by the black body is called the color temperature. At this temperature, the unit of measurement is “K” (Kelvin).

The lower the color temperature value, the warmer the light color. The higher the color temperature value, the cooler the light color.



During the day, the color temperature of daylight constantly changes, from 2000K at sunrise and sunset to 5500-6500K at noon.

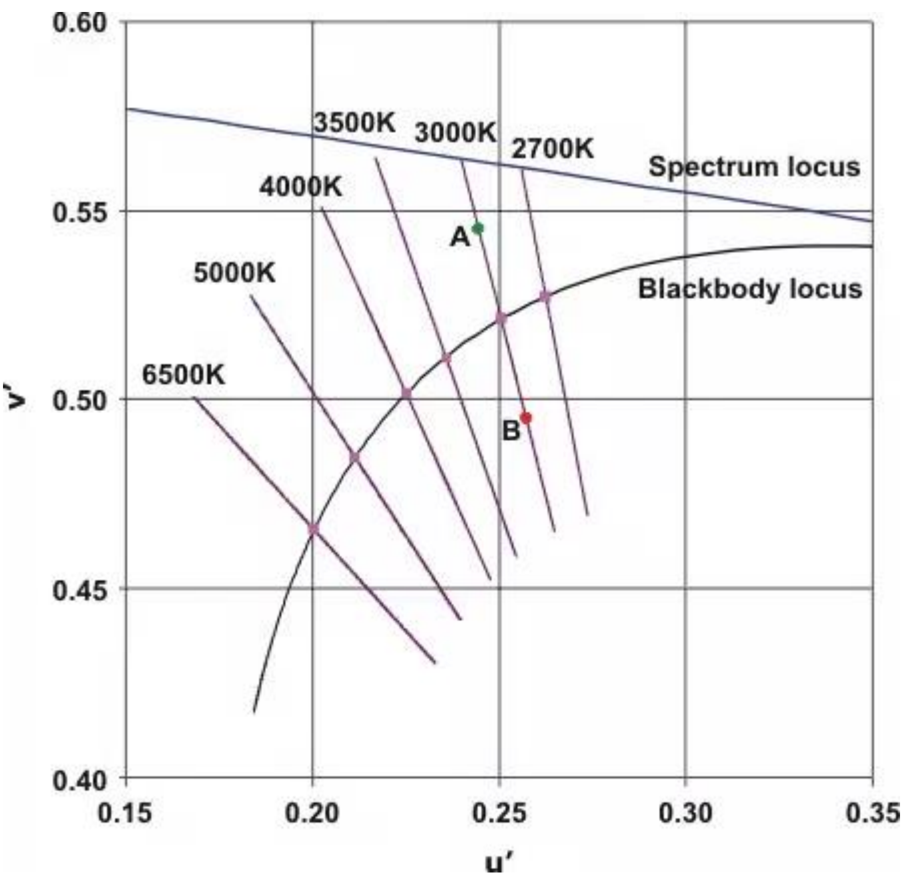


Correlated color temperature VS color temperature?

Color temperature is a measure used to describe the light color on the Planckian locus and produced by a Planckian radiator. This is a somewhat limited metric, as it applies only to the color of light from Planck radiators. Each color temperature unit has a set of chromaticity coordinates in a given color space, and the set of coordinates lies on the Planckian locus.

Correlated color temperature(CCT) is a measure used to describe the color of light located near the Planck locus. This metric has broader applicability because it applies to various fabricated light sources, each producing a spectral power distribution different from that of a Planck radiator. However, it is not as precise as a color temperature quantity since many points along a chromaticity diagram along an isotherm will have the same correlated color temperature.

Therefore, the lighting industry uses correlated color temperature(CCT).



Factors to consider when choosing CCT?

CCT can affect people' s emotions and feelings, so it is essential to choose the correct CCT. Here are some factors that should be considered when selecting a CCT.

Brightness

Brightness can also affect a person' s mood.

CCT VS Lumens

Lumen is a description of how bright a light source is.

CCT describes the color of the light source. The lower the CCT, the more yellow the light source looks; the higher the CCT, the bluer the light source looks. There is no direct relationship between CCT and luminance.

Does CCT affect lumens?

High CCT lumens will also be higher for the same power LED strip.

The main reason is that human eyes are more sensitive to the light of high CCT and feel brighter.

So when choosing a low CCT LED strip, you need to ensure that the lumens ar e enough for you.

Effects of CCT on human feelings

Color temperature has a significant influence on human emotions. Warm white light makes people feel warm and relaxed. In contrast, the cold white light makes people feel severe, challenging, and low.

Adjustable CCT

Are you also thinking, is there a kind of LED light strip CCT that can be a djusted according to your needs? Yes, our CCT adjustable LED strip can meet your needs.

You can connect the adjustable CCT LED strip to the controller and then sel ect the CCT you need through the controller.

How to choose the right CCT?

The most used color temperatures are 2700K, 3000K, 4000K, and 6500K. What c olor temperature to choose depends on where we want to use them and what ki nd of atmosphere we want to create.

Kelvin Color Temperature	2700K	3000K	3500K	4100K	5000K	6500K
Associated Effects and Moods	Ambiant Intimate Personal	Calm Warm	Friendly Inviting	Precise Clean Efficient	Daylight Vibrant	Daylight Alert
Appropriate Applications	Living/Family Rooms Commercial/ Hospitality	Living/Family Rooms Commercial/ Hospitality	Kitchen/Bath Light Commercial	Garage Commercial	Commercial Industrial Institutional	Commercial Industrial Institutional

When to choose extra warm white 2700K?

Extra warm 2700K LED strip lights have a comfortable, intimate, warm white light that we recommend in living rooms and bedrooms. Warm white light is also considered conducive to relaxation. You may need a warmer light to prepare for sleep, as blue light can suppress the melatonin hormone the body naturally produces to fall asleep. For commercial applications, a warm glow creates a gentle, personal, homey atmosphere in restaurants, hotels, and retail stores.

When to choose warm white 3000K?

Compared to 2700K, 3000K looks whiter.

We recommend using white 3000K lighting in kitchens and bathrooms.

Compared to 2700K, the warm light of 3000K creates a relaxing atmosphere, but the surroundings are more precise and suitable for living areas where you usually do tasks. The warm light 3000K creates a comfortable, homey atmosphere for business applications in guest rooms, cafes, and clothing stores.

When to choose neutral white 4000K?

White 4000K has a clean, focused, neutral white light that can fit nicely in dens, garages, and kitchens. Compared to warm lighting, neutral white relaxes you and allows you to focus your attention. For commercial applications, this is ideal for offices, grocery stores, hospitals, classrooms, and jewelry boutiques, especially those selling diamonds or silver.

When to choose cool white 6500K?

White 6500K is recommended for workplaces that require improved attention and performance. These places can be laboratories, factories, and hospitals. Another critical application is agriculture, especially indoor gardening.

Why does the same CCT LED light look different?

You may encounter the problem that the same CCT LED lights, but the colors look different. Why does this problem happen?

Test equipment

The machine that tests the CCT is also called an integrating sphere. There are many brands and models of integrating spheres, and they all have different accuracy. So, LED lights from various manufacturers will have different colors for the same CCT if they use different integrating spheres.

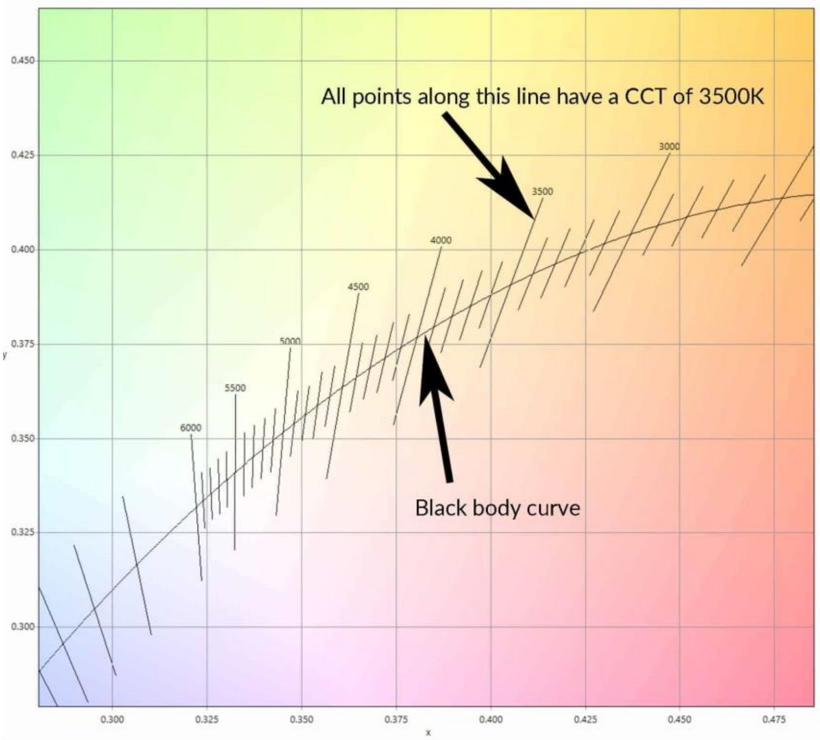
The integrating sphere needs to be calibrated every month. If the integrating sphere is not calibrated on time, the test data will also be inaccurate.



CCT tolerance

Although LED lights are marked with 3000K, it does not mean that the actual CCT is 3000K. Different manufacturers have different CCT tolerance and control capabilities, so LED lights marked with the same CCT may have another actual CCT. Good manufacturers use color tolerance standards within three steps macadam for consistent color matching.

Duv



According to the definition of CCT, the light of the same CCT may have different color coordinates. The color will be reddish if the coordinate point is above the blackbody curve. Under the blackbody curve, it will be greenish. Duv is to describe this characteristic of light. Duv describes the distance of the light coordinate point from the blackbody curve. A positive Duv means the coordinate point is above the blackbody curve. While a negative one means it is below the blackbody curve. The larger the value of Duv, the farther it is from the blackbody curve.

So, the CCT is the same, but the Duv is different; the light's color will look different.

For more information about Duv, please check here.

How to Connect LED Strip to Power Supply?

Most high-quality LED strips are low-voltage LED strips that need to be connected to a power supply to work. The power supply is also called an LED driver because it drives the LED strip to work. The power supply is also called an LED transformer because it converts the mains 220VAC or 110VAC to 12V or 24V.

Voltage and wattage

First, you need to check the working voltage of your LED strip, and the most common working voltage is 12V or 24V. You must ensure that the operating voltage of the LED strip is the same as the power supply's output voltage.

Second, you need to calculate the total power of the LED strip. The calculation method is to multiply the power of one meter LED strip by the total number of meters.

Finally, according to the 80% principle, you need to ensure that 80% of the power supply wattage is greater than or equal to the total wattage of the LED strip. This will help extend the life of the power supply.

Power supply with DC connector

The LED strip has a DC female connector, and the power supply has a DC male connector.

This power supply is also called a power adapter.

LED strip with DC connector

If the LED strip happens to have a DC female and the power supply has a DC male, you need to plug the DC female and DC male and connect them.



LED strip with open wires

If the LED strip only has open wires, you need to buy the accessories that convert the wires to DC connectors and then connect them.



LED strip without wires after cutting

When the LED strip is cut, how do I connect it to a plug-in power supply?

You can connect the LED strip via a solderless wire connector or soldering a DC female connector.

The AC power plug of the power adapter can be inserted into the socket to supply power to led strip lights. Corresponding to small projects, this is very convenient and suitable.

Power supply with open wire

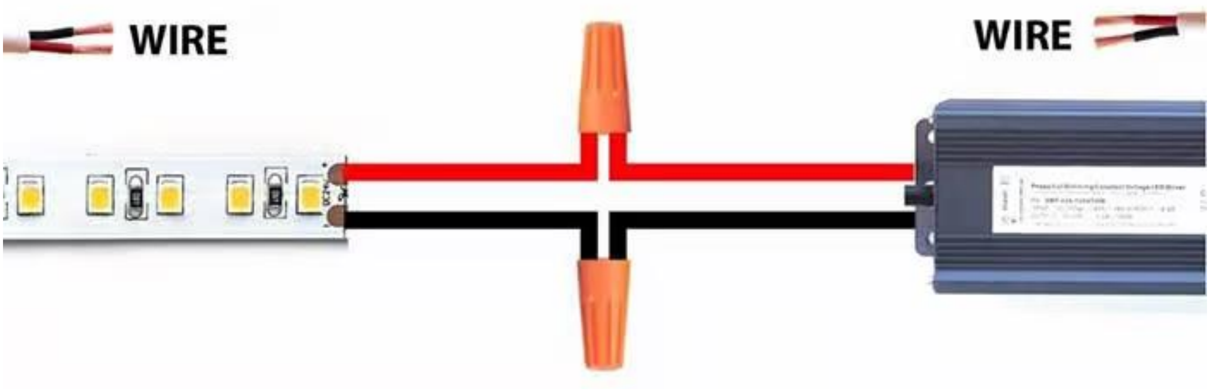
A power supply with an open wire usually is a waterproof power supply.

LED strip has open wires

You can hardwire the wires from the LED strip to the cables from the power supply.

Twist the two red wires together, then cover and tighten the wire nut. The same goes for the black wire.

Note that you need to ensure that the red wire is connected to the red wire and the black wire is connected to the black wire. If misconnected, the LED strip will not work.

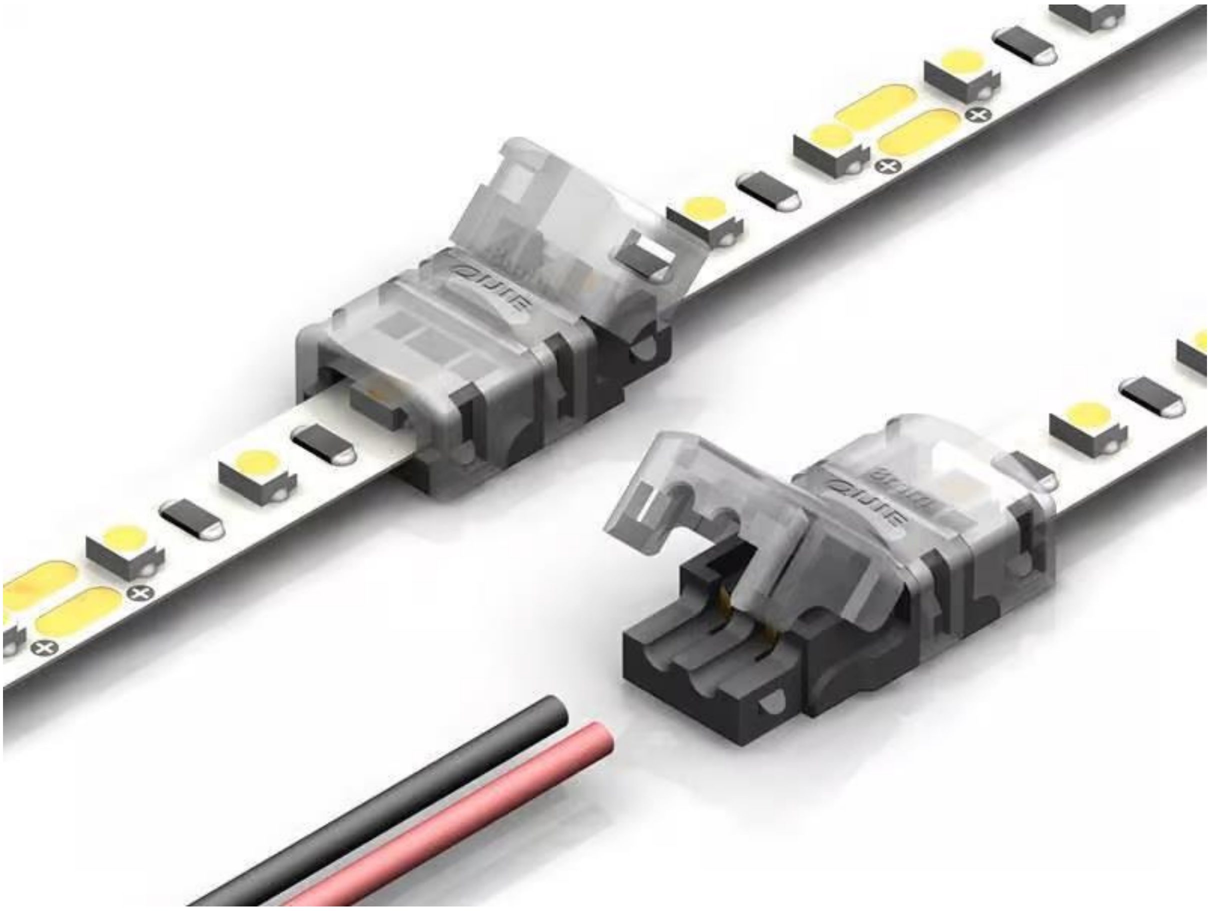


Another option is that you can connect the wires with a solderless wire con nector.



LED strip without wires after cutting

For LED strips without any wires, you can solder wires to the LED strip or use solderless LED strip connectors. Then use the method above to connect the LED strip to the power supply.



Power supply without wire

A power supply without wires is generally a non-waterproof power supply with terminals for wiring.

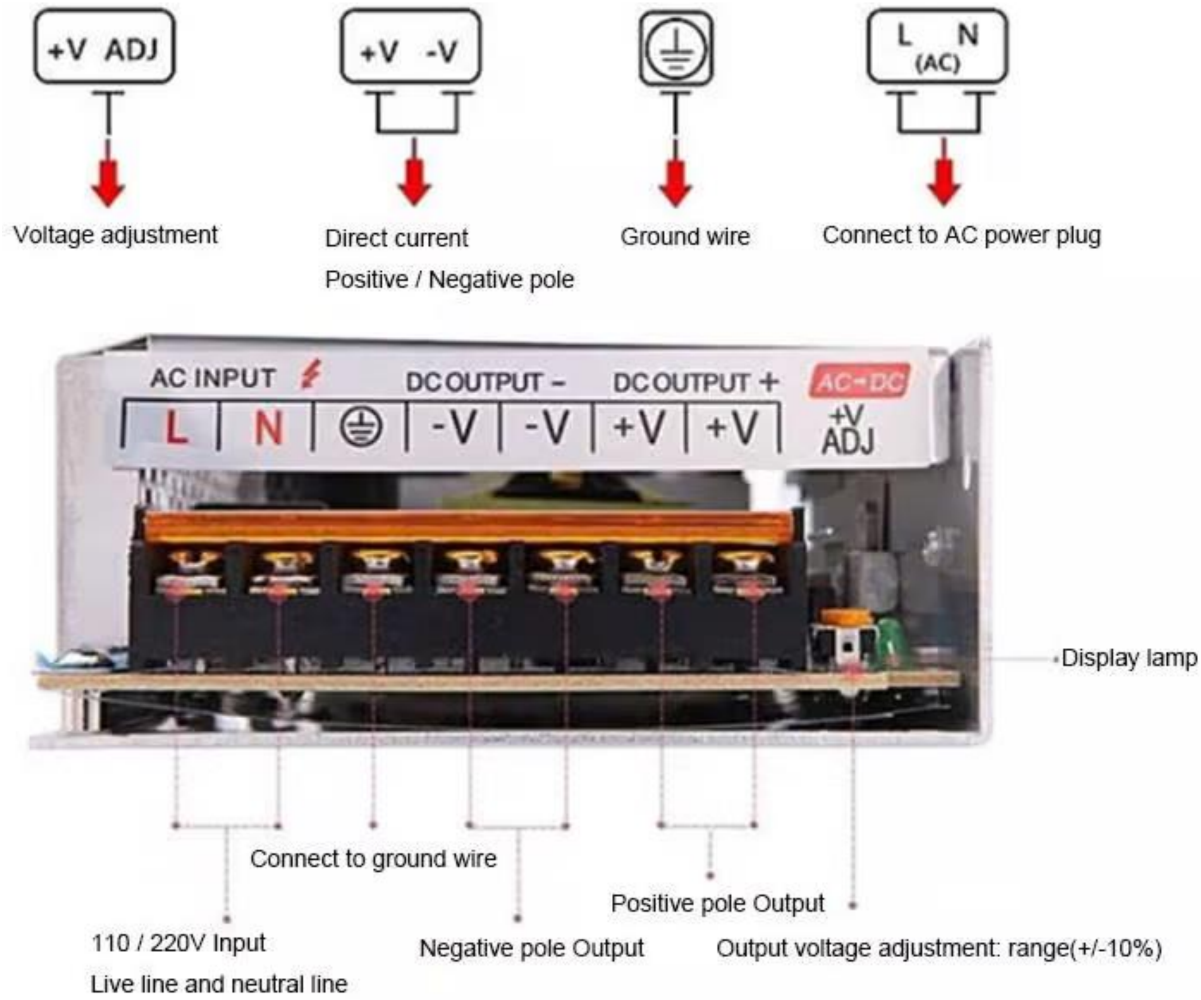
You'll need a screwdriver to operate this power supply because the terminals are fastened to the wires by screws.

Step 1: Unscrew the screw on the terminal block with a screwdriver.

Step 2: Put the wire of the LED strip into the corresponding position.

Step 3: After inserting the wires of the LED strip, tighten the screws with a screwdriver, and pull by hand to test if they are tight enough.

Step 4: Connect the AC plug in the same way.



For more details on the wiring diagram of the LED light strip, please read [How to Wire LED Strip Lights(Diagram Included)].

Can I connect multiple LED strips to the same LED power supply?

Yes, you can connect multiple LED strips to the same power supply, but you need to ensure that 80% of the power supply's wattage is greater than the total wattage of the LED strips.

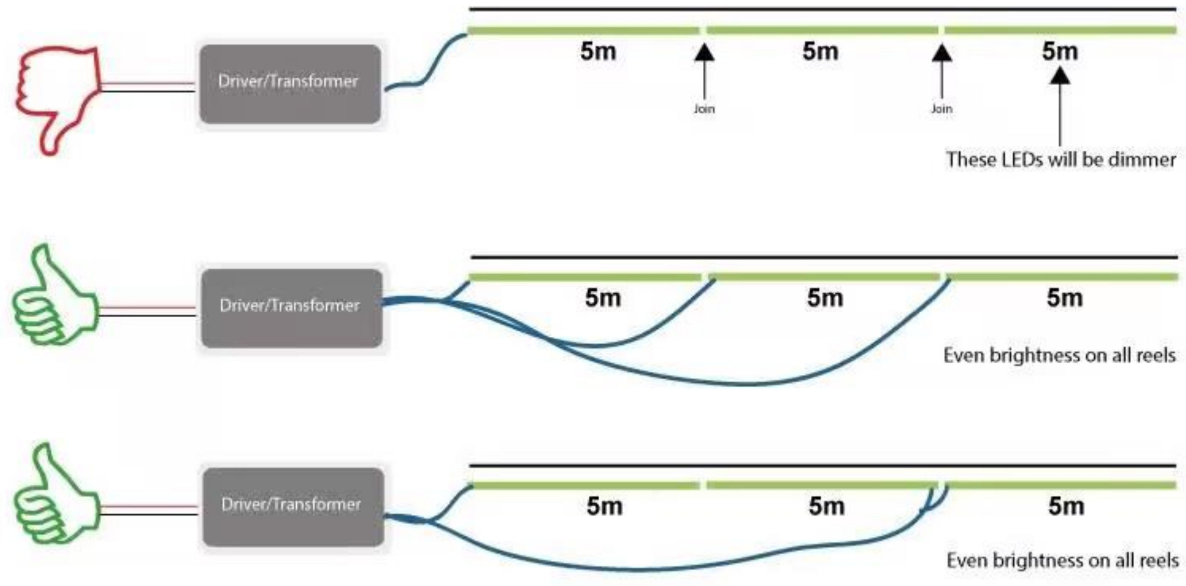
Serial connection

When you connect multiple LED strips in series, there may be a voltage drop problem, and the further the LED strips are from the power supply, the dimmer it will be.

More information about voltage drop, you can read [What is LED strip voltage drop?]

Parallel connection

The inconsistent brightness of LED strips is unacceptable. To get around this, you can connect multiple LED strips to the power supply in parallel.



How to Wire LED Strip Lights(Diagram Included)

LED strip lights are becoming increasingly popular in a variety of settings. Many people enjoy the modern look and feel that they create, as well as the fact that they are relatively easy to install. This article will detail how to wire various types of LED strips, including single color, tunable white, RGB, RGBW, RGBCCT, and addressable LED strips.

To better understand how to wire, we need to learn about voltage drop and parallel connection first.

Voltage drop

The LED strip voltage drop means that the PCB and wires will draw voltage, causing the part of the LED strip near the power supply to be brighter than

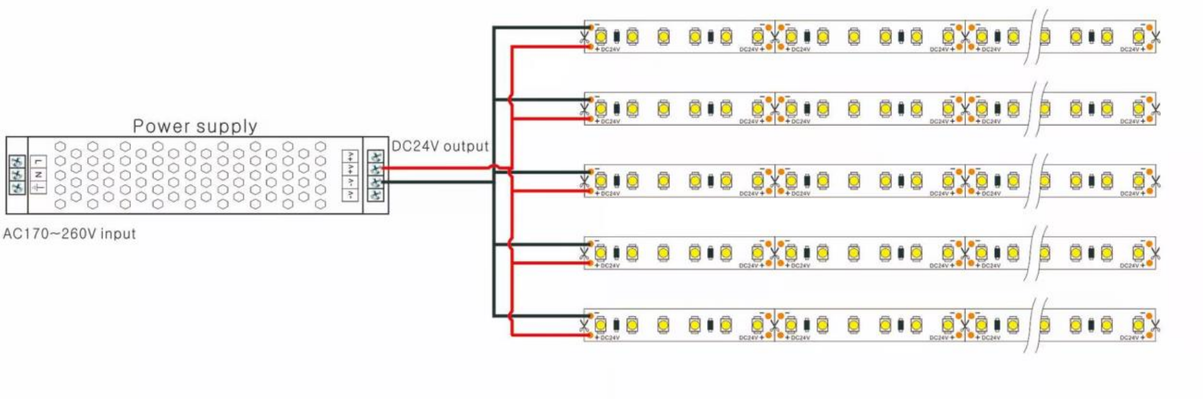
the end. The brightness inconsistency caused by the voltage drop is something we need to avoid.

We can avoid the voltage drop problem by connecting multiple LED strips to the power supply in parallel rather than serially.

Alternatively, we can use [ultra-long constant current LED strips].
For more information on voltage drop, please read [What is LED strip voltage drop?]

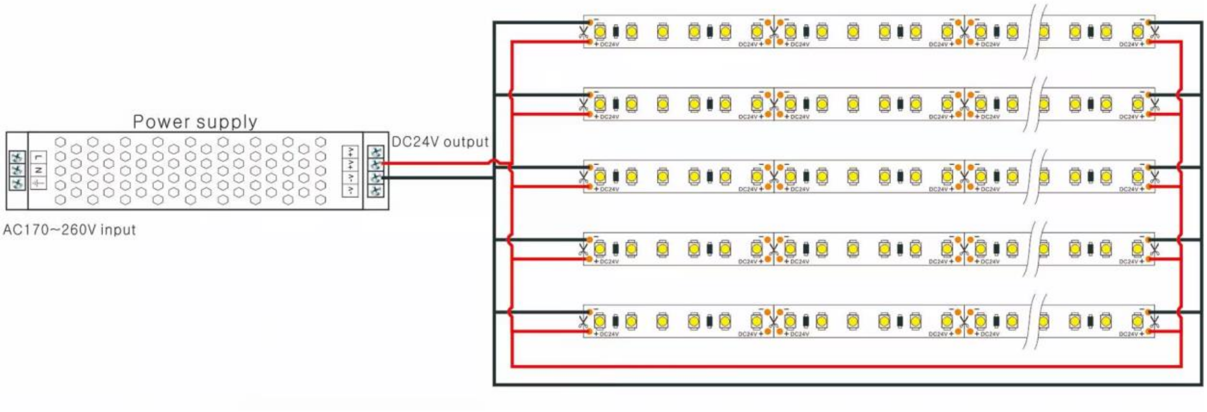
Parallel connection

The most common way to avoid voltage drop problems is to connect multiple LED strips in parallel to a power supply, controller, or amplifier.



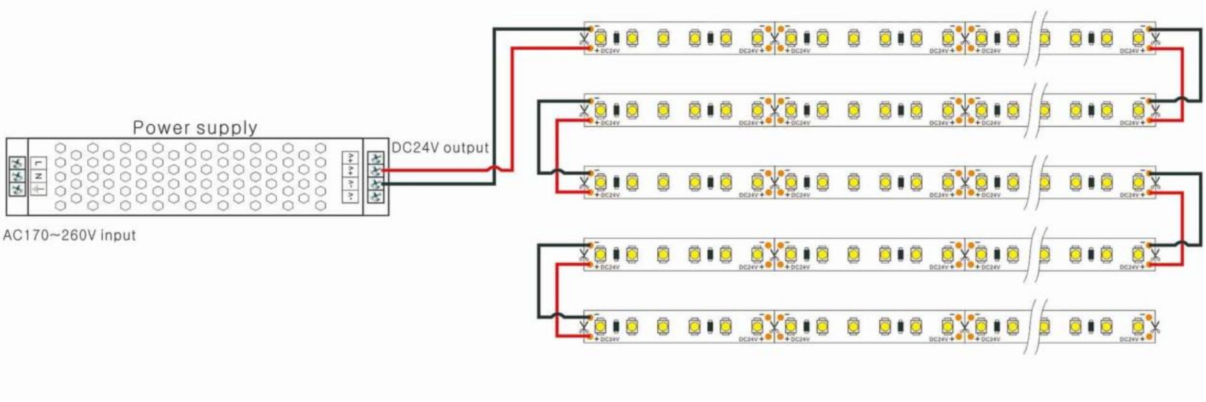
led strip parallel connection

Another way is to connect both ends of the LED strip to the same power source, controller, or amplifier.



led strip both end connection

Be sure NOT to connect multiple strips in series to a power supply, controller, or amplifier.



led strip serial connection

PWM amplifier

All LED controllers output a PWM signal. If an LED controller does not output enough power, a PWM amplifier can increase the PWM power, thus allowing the LED controller to drive a sufficient number of LED strips.

How to wire single color LED strip lights

The single color or mono LED strip light is the simplest. It only has two wires and can only emit light of a specific color.

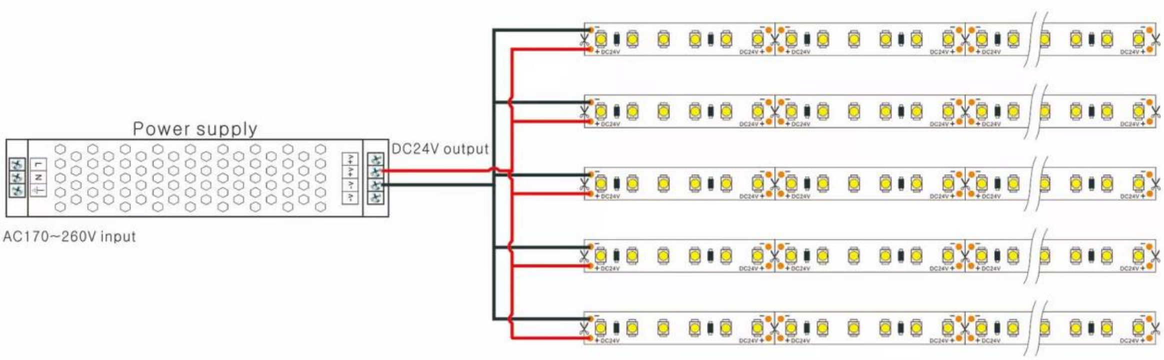


single color led strip light

Wring single color LED strip lights with non dimmable LED driver s

The most common is a single-color LED strip connected to a non-dimmable pow er source with no controller.

Please note that the power of the total LED strip lights should not exceed 80% of the power supply power, which is the principle of 80% of the power s upply power.



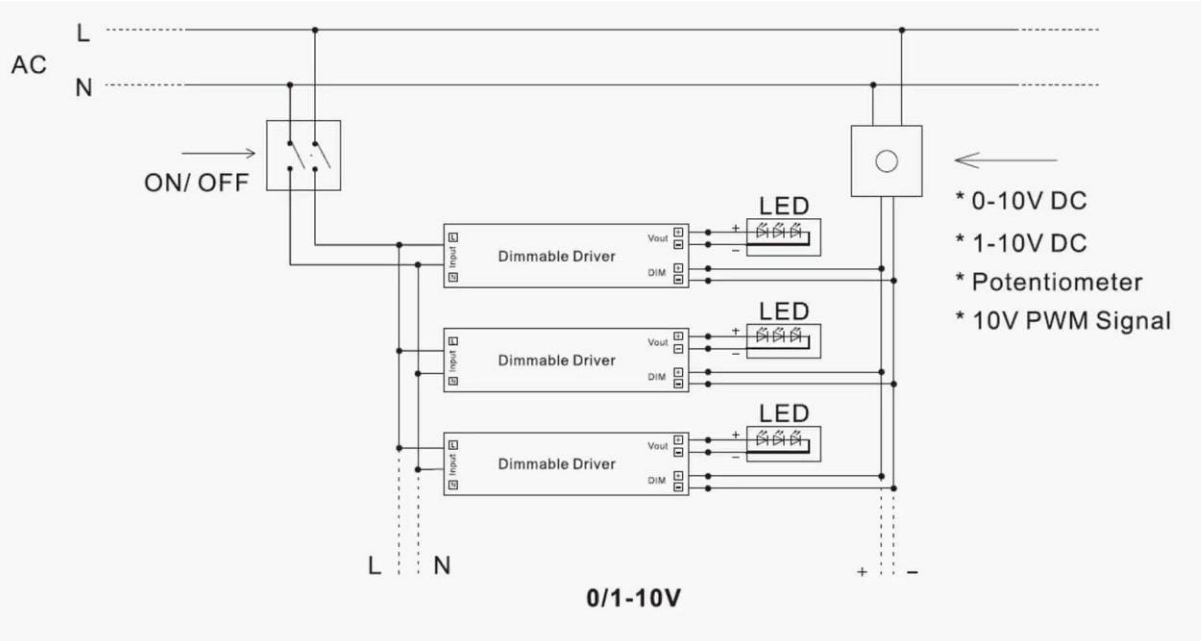
led strip parallel connection

Wring single color LED strip lights with dimmable LED drivers

Sometimes, we need to adjust the brightness of the LED strip. So we need to connect the single-color LED strip with the dimmable power supply.

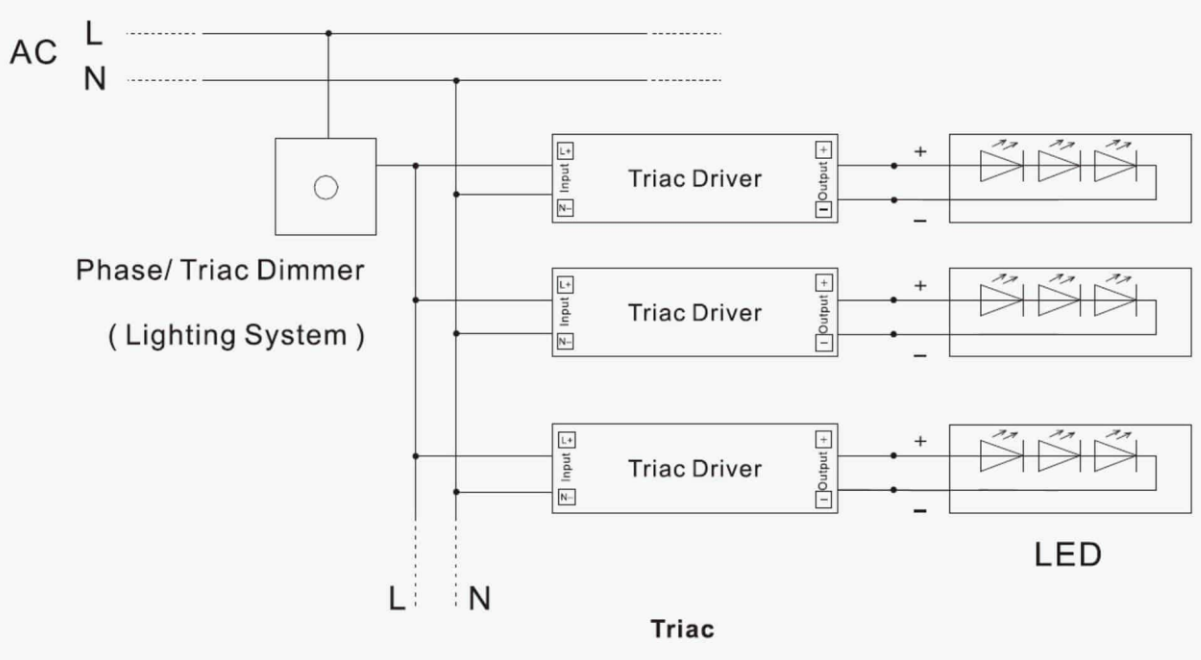
The most common dimming methods are 0-10V, Triac, and DALI.

0-10V dimmable LED driver connection diagram



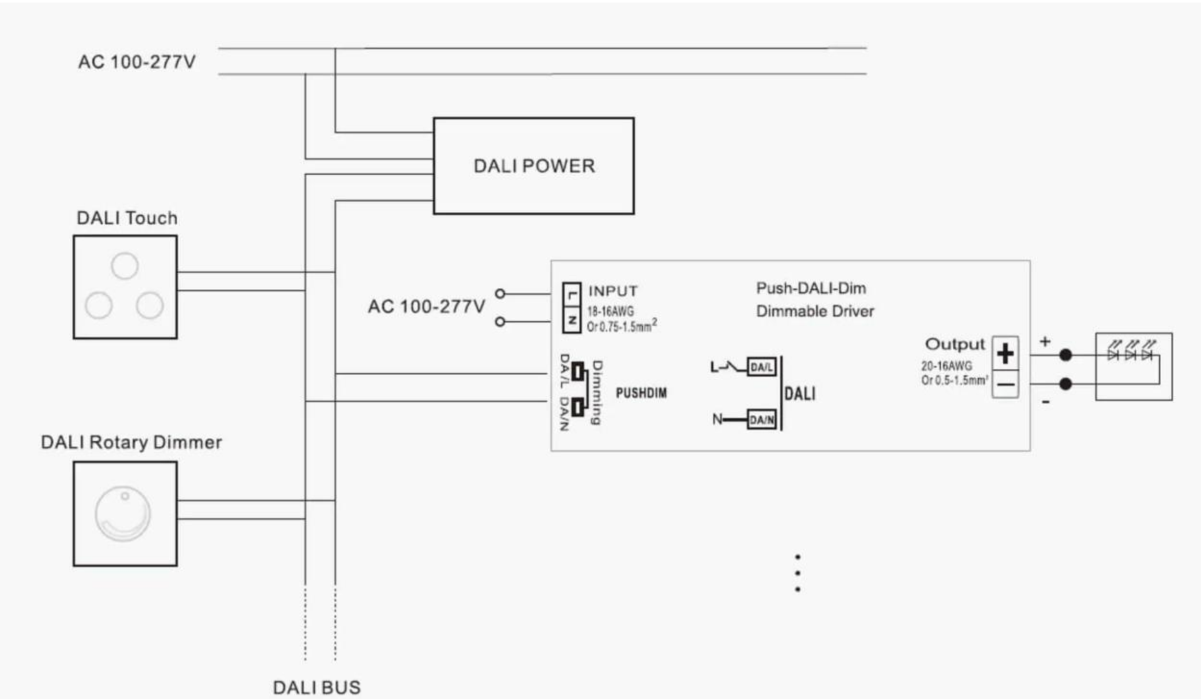
single color led strip 0 10v connection diagram

Triac dimmable LED driver connection diagram



single color led strip triac connection diagram

DALI dimmable LED driver connection diagram



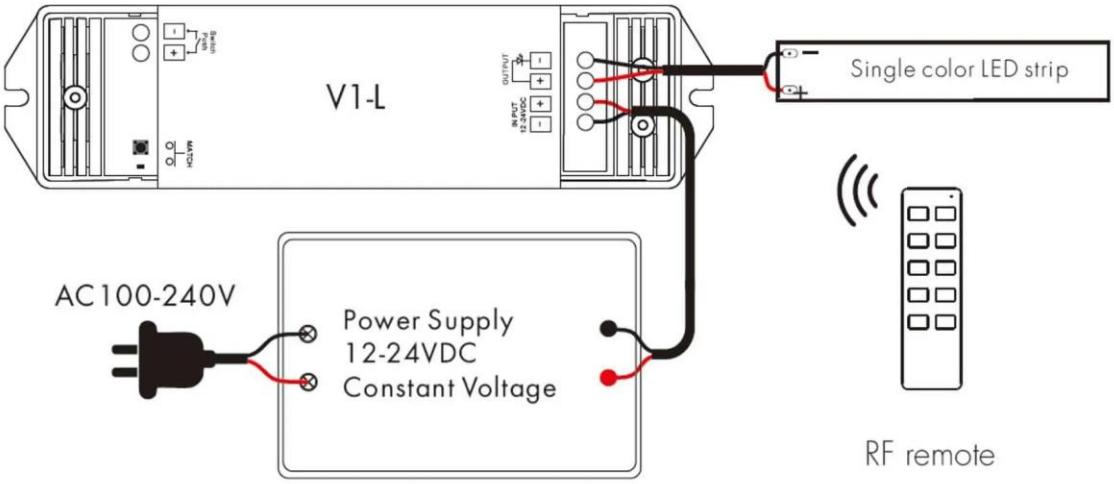
single color led strip dali connection diagram

Wring single color LED strip lights with LED controllers

In addition, the single-color LED strip light can also be connected to the controller to adjust the brightness.

Without PWM amplifier

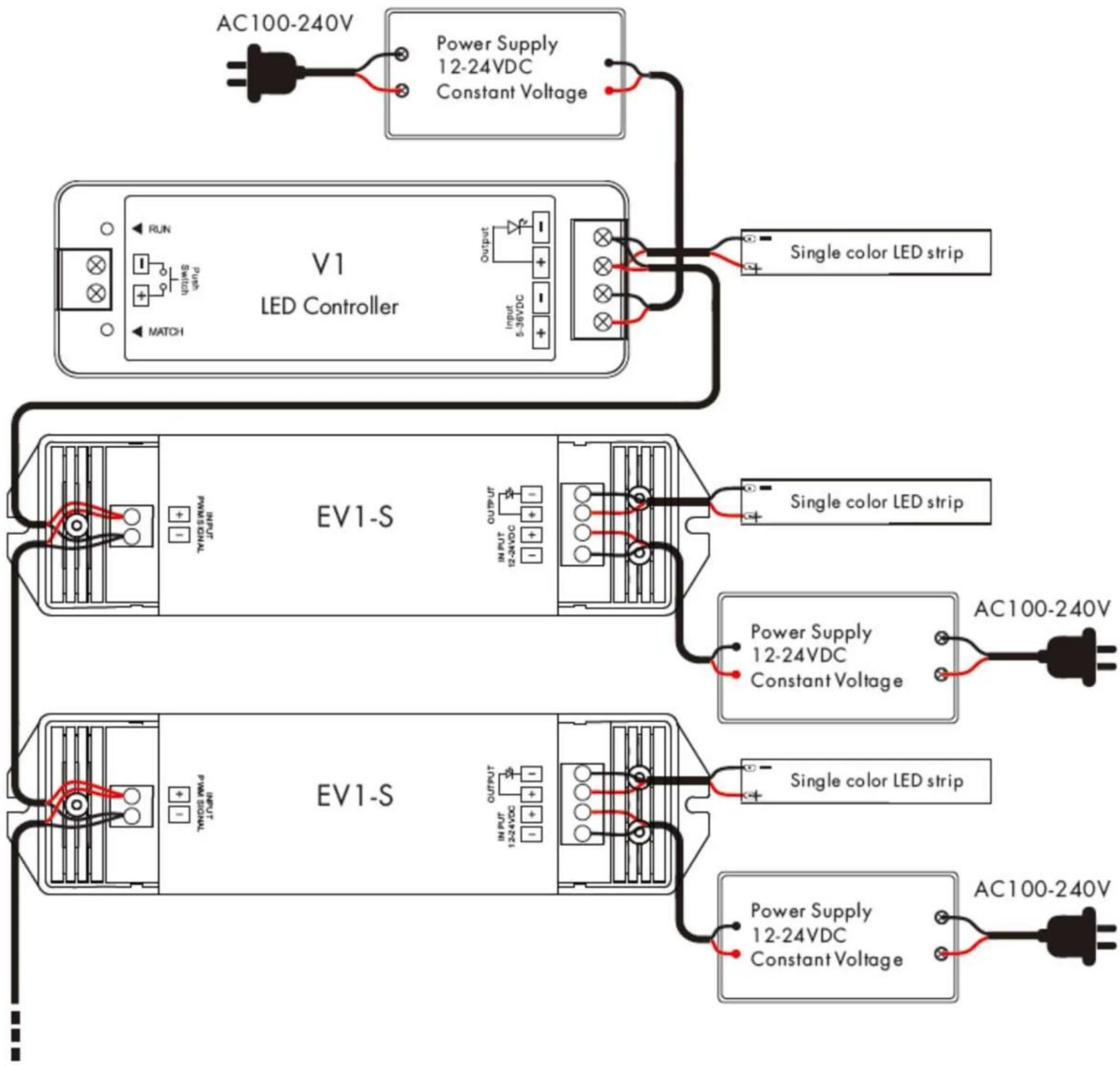
When you connect a small number of LED strips with an LED controller, an LED amplifier is not necessary.



single color led strip controller connection diagram without amplifier

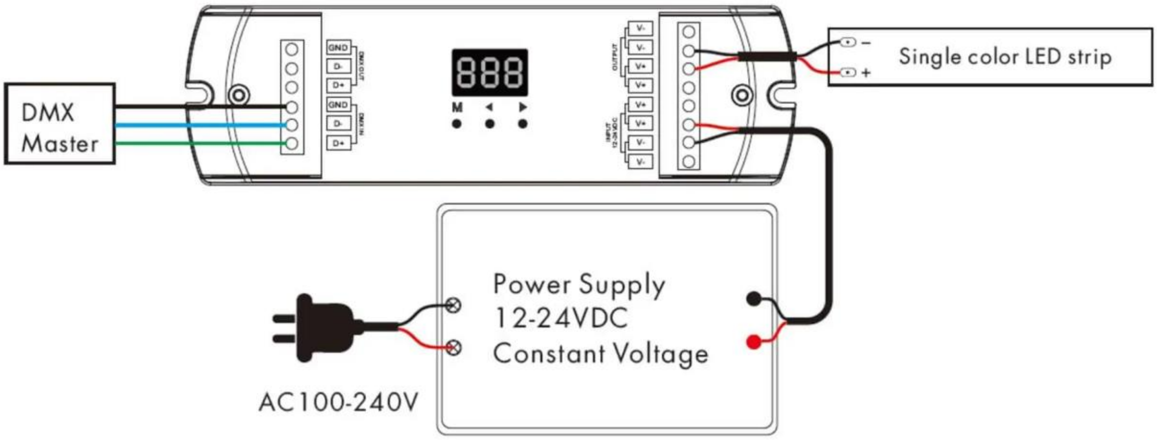
With PWM amplifier

For large lighting projects, many LED strips are required. LED amplifiers are needed when many LED strips are connected to the controller.



single color led strip controller connection diagram with amplifier

Wring single color LED strip lights with DMX512 decoder



single color led strip dmx512 decoder connection diagram

How to wire tunable white LED strip lights

Tunable white LED strip light, also called CCT adjustable LED strip light, usually has three wires and two different color temperature LEDs. You can adjust the brightness of two different CCT LEDs to change the mixed CCT.



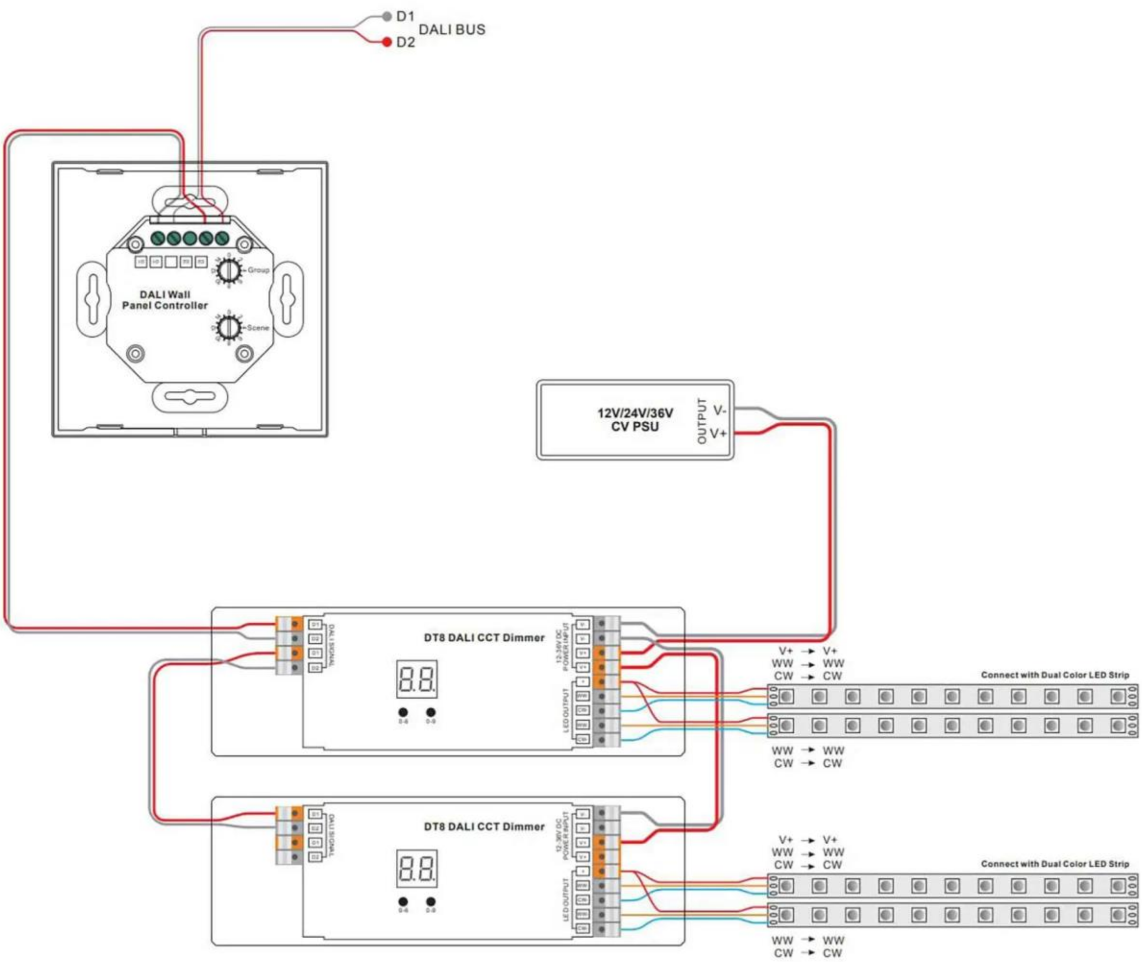
tunable white led strip light

Wring tunable white LED strip lights with dimmable LED drivers

In most cases, dimmable power supplies can only be used to adjust the brightness of single-color LED strips.

However, DALI adds the DT8 protocol to support tunable white, RGB, RGBW, and RGBCCT LED strip lights.

DALI DT8 tunable white LED driver

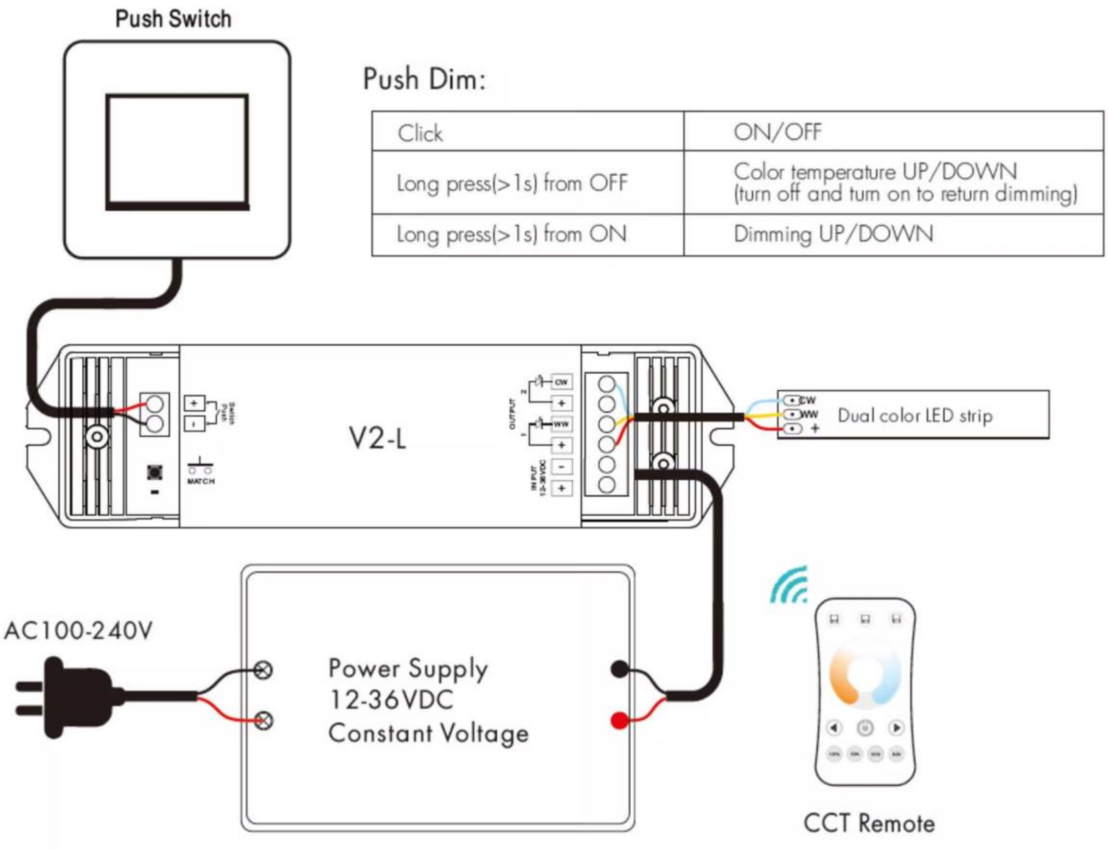


tunable white dt8 dali connection diagram

Wring tunable white LED strip lights with LED controllers

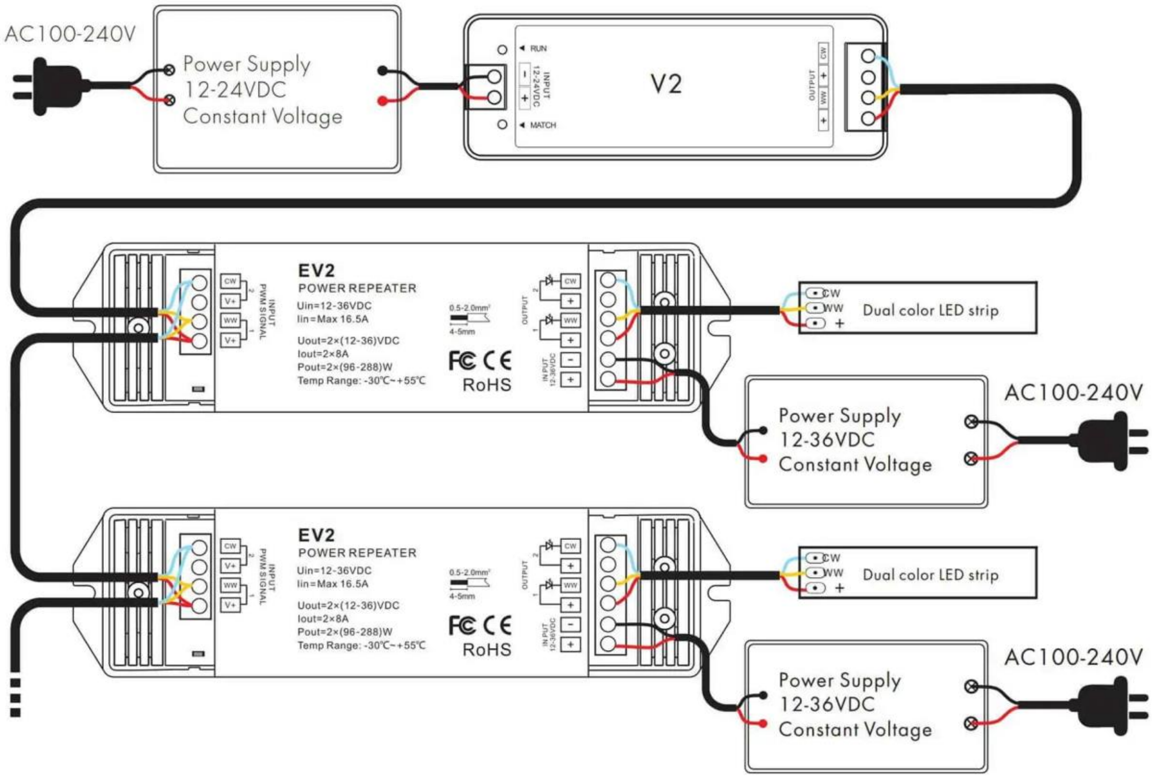
Only a tunable white LED controller is required for a small number of adjustable color temperature LED strips. If the number is large, then a PWM amplifier is needed.

Without PWM amplifier



tunable white controller connection without amplifier diagram

With PWM amplifier

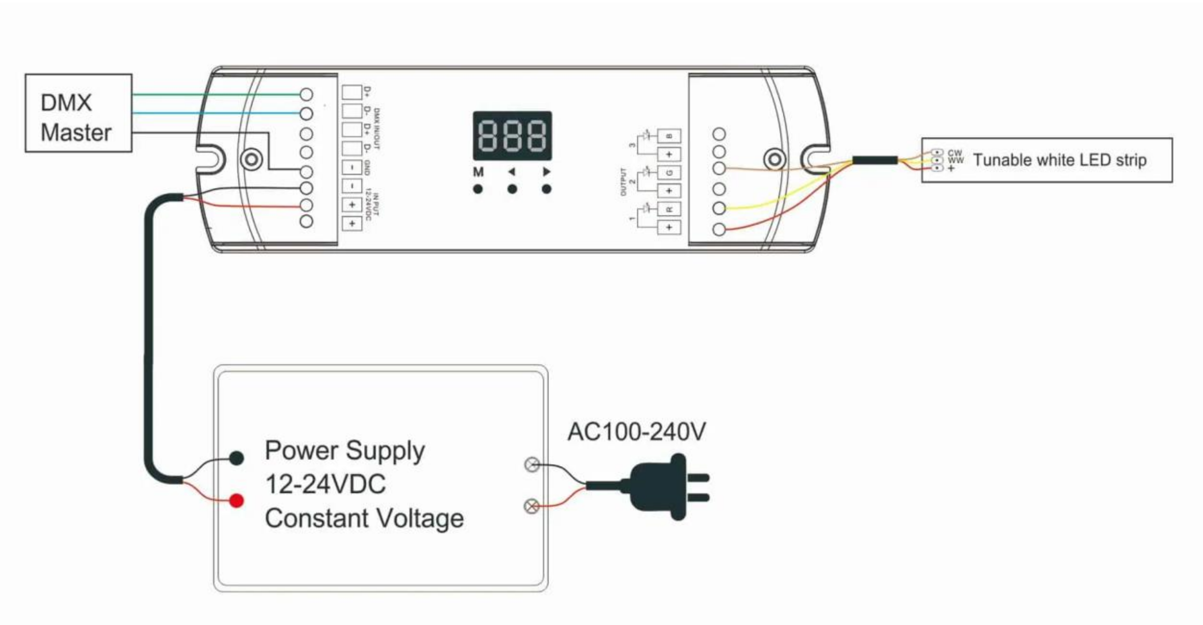


tunable white controller connection with amplifier diagram

Wring tunable white LED strip lights with DMX512 decoder

Generally, there is no dedicated DMX512 decoder (2 channels output) for adjustable color temperature LED strips.

But we can use the 3-channel or 4-channel output DMX512 decoder to control the adjustable color temperature LED strip.



tunable white dmx512 decoder connection diagram

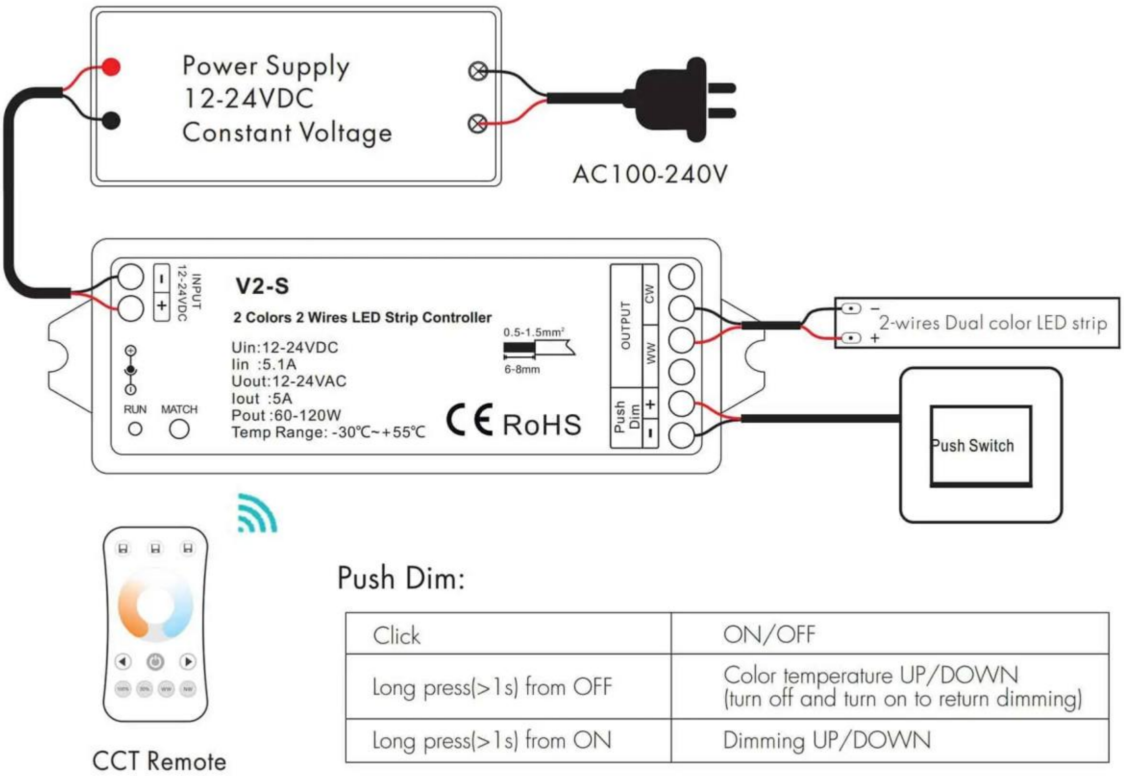
Two wires tunable white LED strip lights

There is also a 2-wire adjustable color temperature LED strip.

There is also a 2-wire adjustable color temperature LED strip. The 2-wire color temperature LED strip can be made narrower for some narrow places.

For more details, please click here.

2-wire tunable LED strip requires the unique tunable white LED controller.



2 wire tunable white led strip connection diagram

How to wire RGB LED strip lights

RGB LED strip has four wires, which are common anode, R, G, and B.

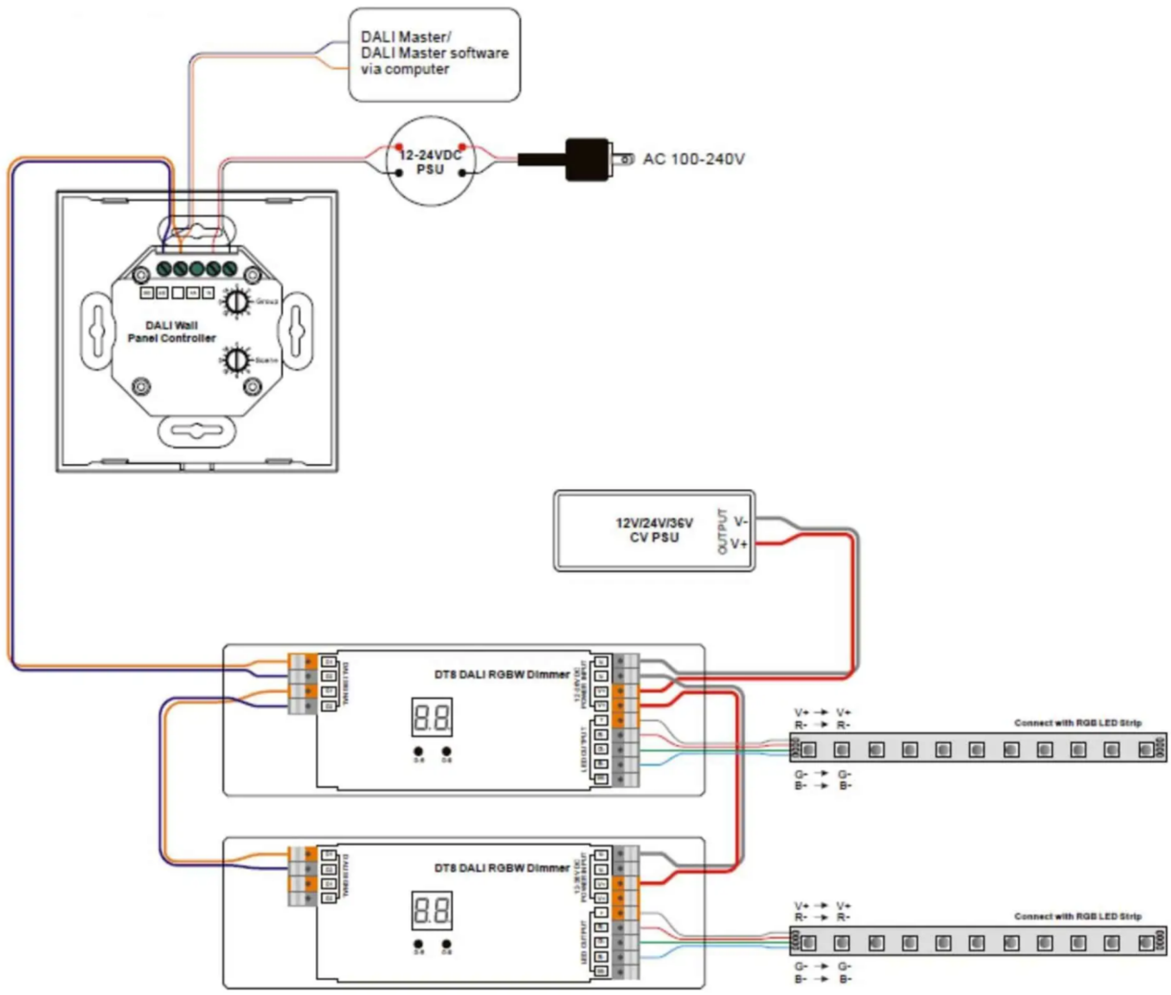
RGB LED strips are mainly used with LED controllers but can also be used with DALI DT8 dimmable drivers.



rgb led strip light

Wring RGB LED strip lights with dimmable LED drivers

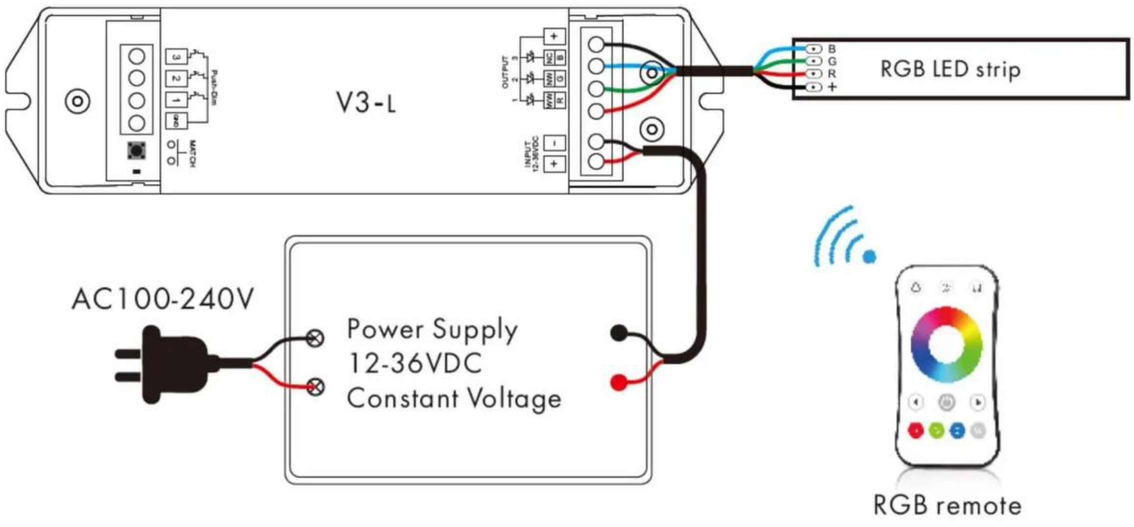
DALI DT8 RGB LED driver



rgb led strip dali dt8 connection diagram

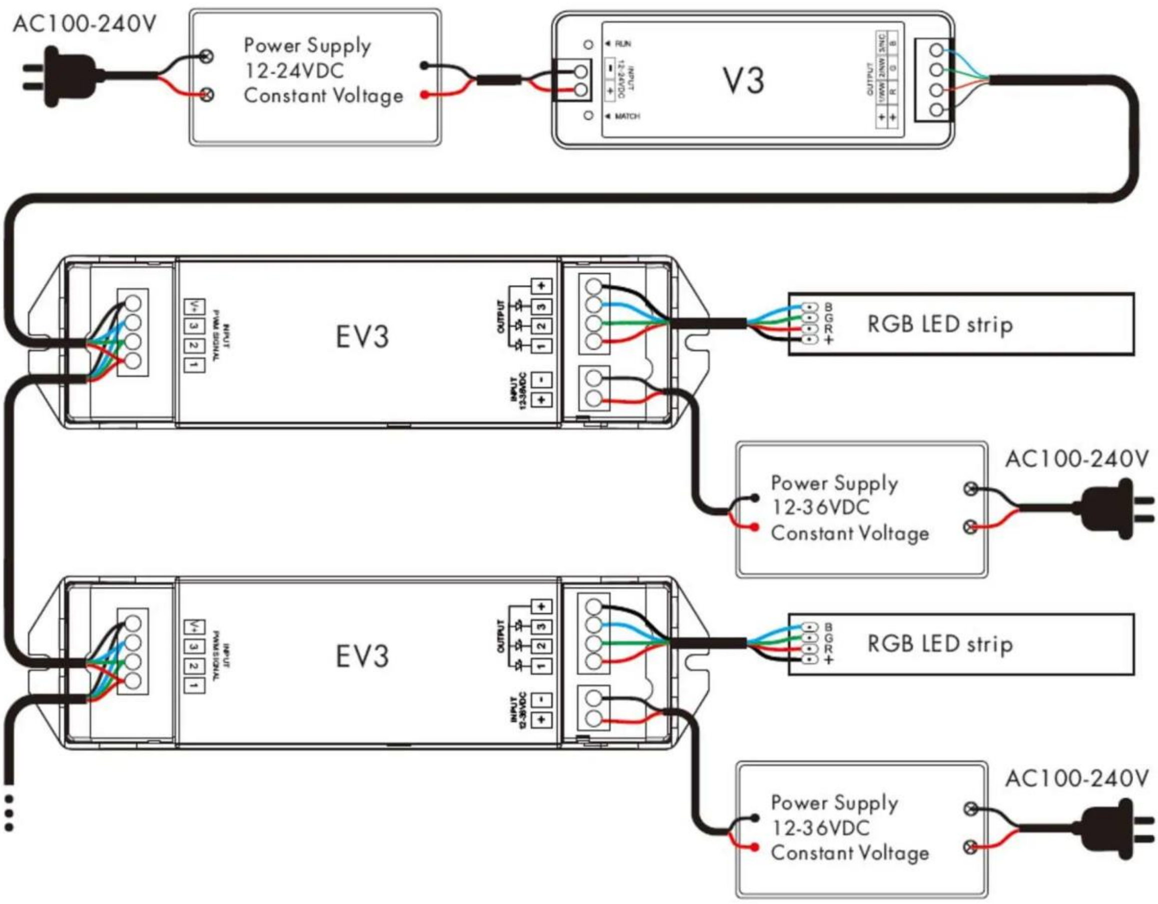
Wring RGB LED strip lights with LED controllers

Without PWM amplifier



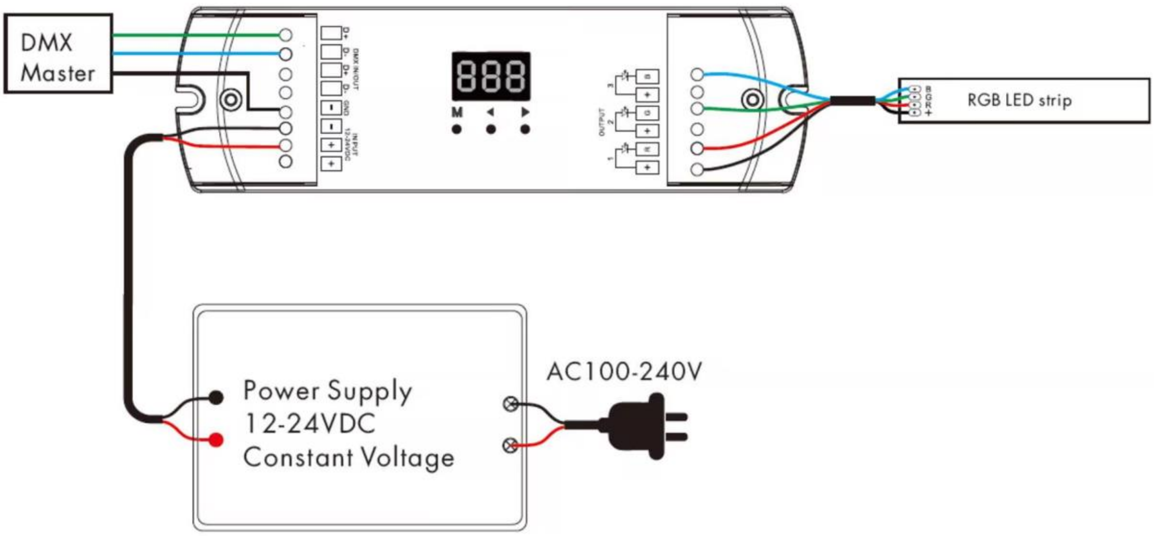
rgb led strip controller connection without amplifier diagram

With PWM amplifier



rgb led strip controller connection with amplifier diagram

Wring RGB LED strip lights with DMX512 decoder



rgb led strip dmx512 decoder connection diagram

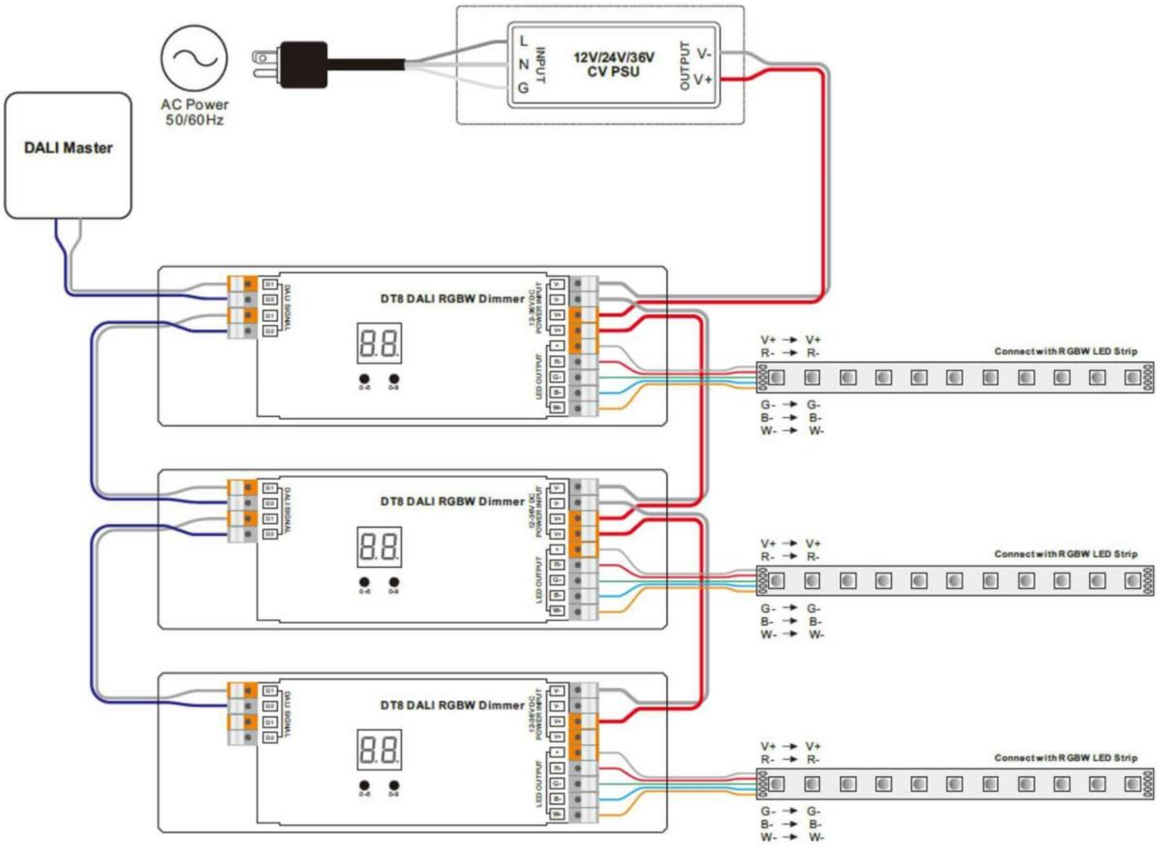
How to wire RGBW LED strip lights



rgbw led strip light

Wring RGBW LED strip lights with dimmable LED drivers

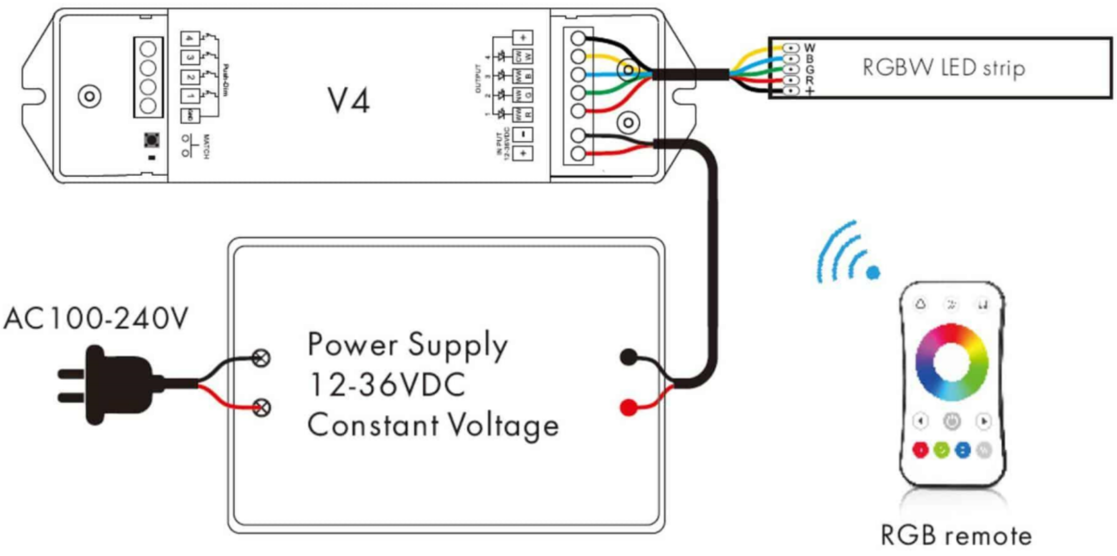
DALI DT8 RGBW LED driver



rgbw led strip dali dt8 connection diagram

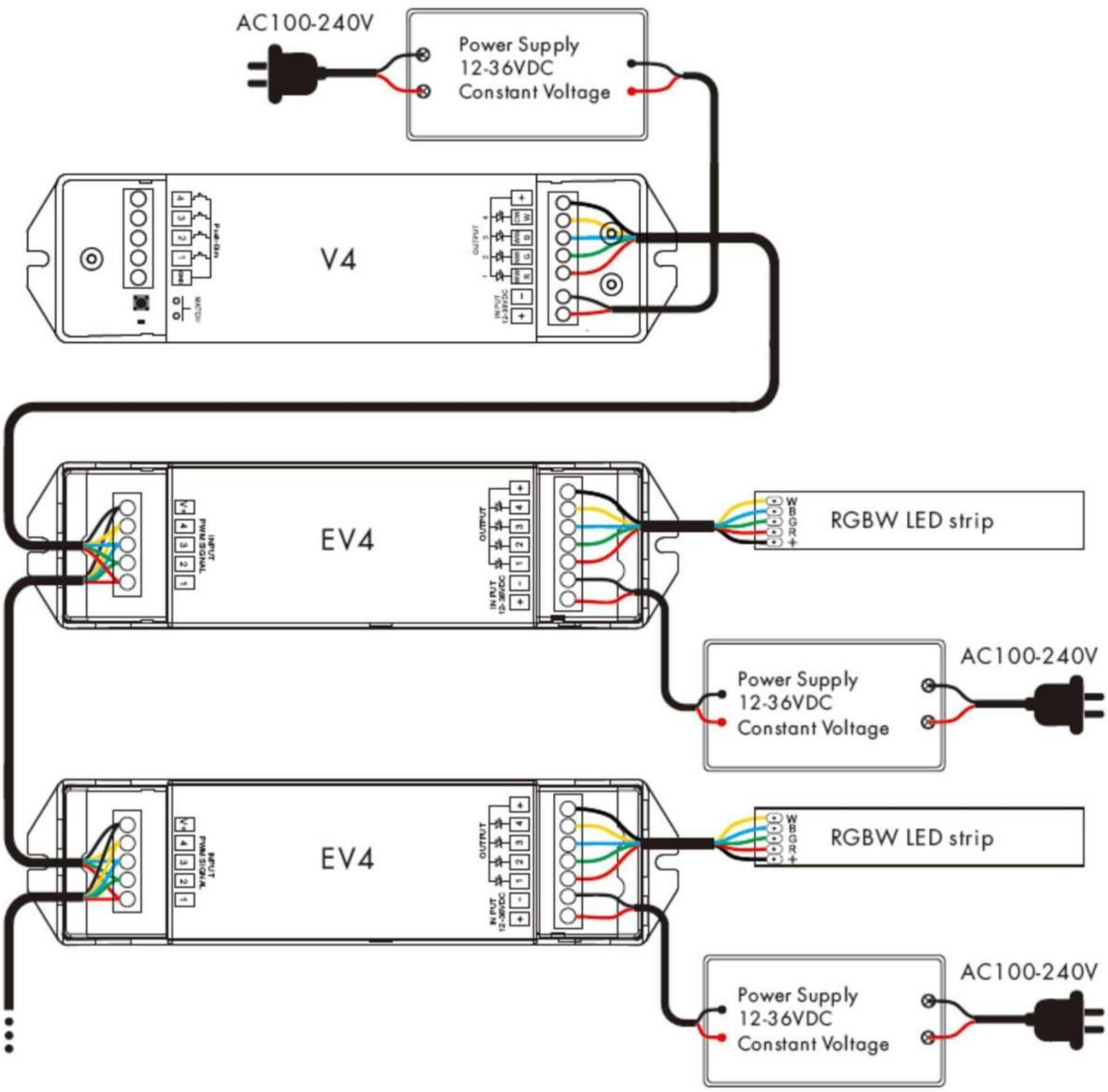
Wring RGBW LED strip lights with LED controllers

Without PWM amplifier



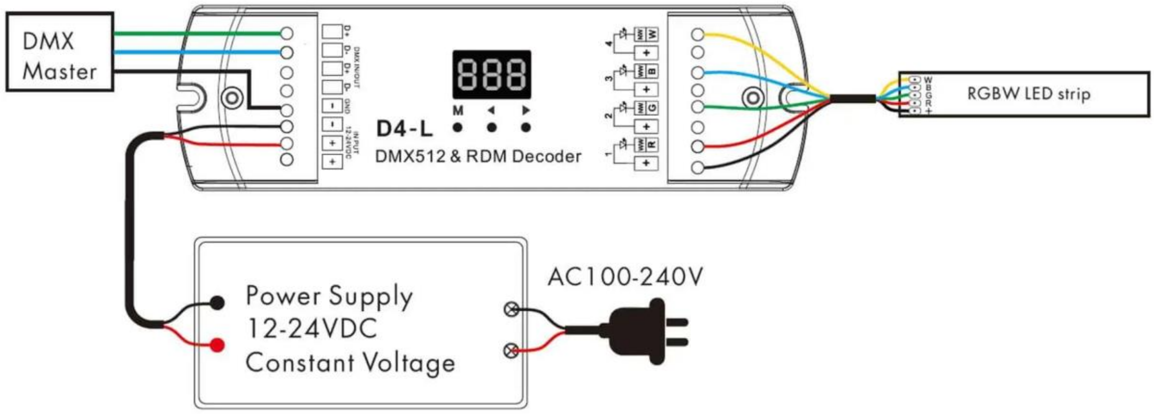
rgbw led strip controller without amplifier connection diagram

With PWM amplifier



rgbw led strip controller with amplifier connection diagram

Wring RGBW LED strip lights with DMX512 decoder



rgbw led strip dmx512 decoder connection diagram

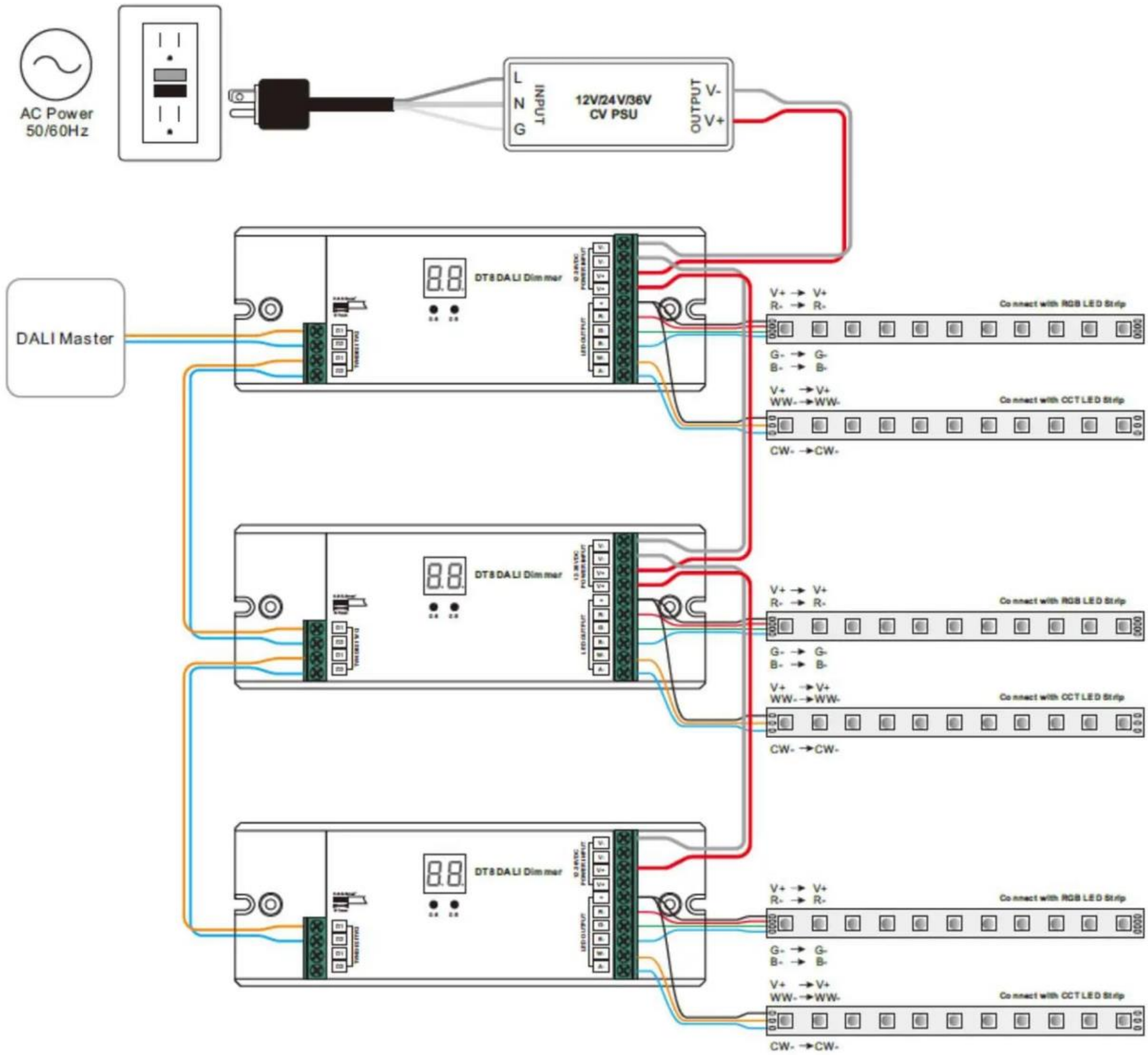
How to wire RGBCCT LED strip lights



rgbcct led strip light

Wring RGBW LED strip lights with dimmable LED drivers

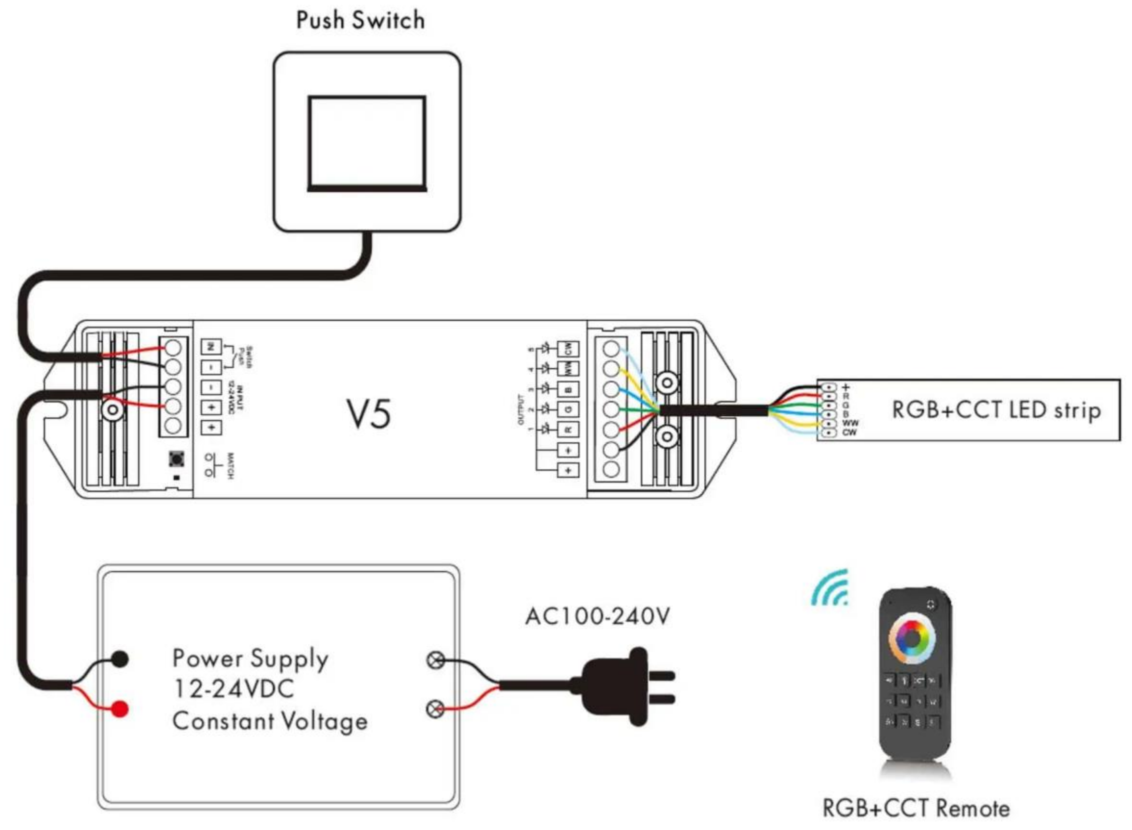
DALI DT8 RGBW LED driver



rgbcct led strip dali dt8 connection diagram

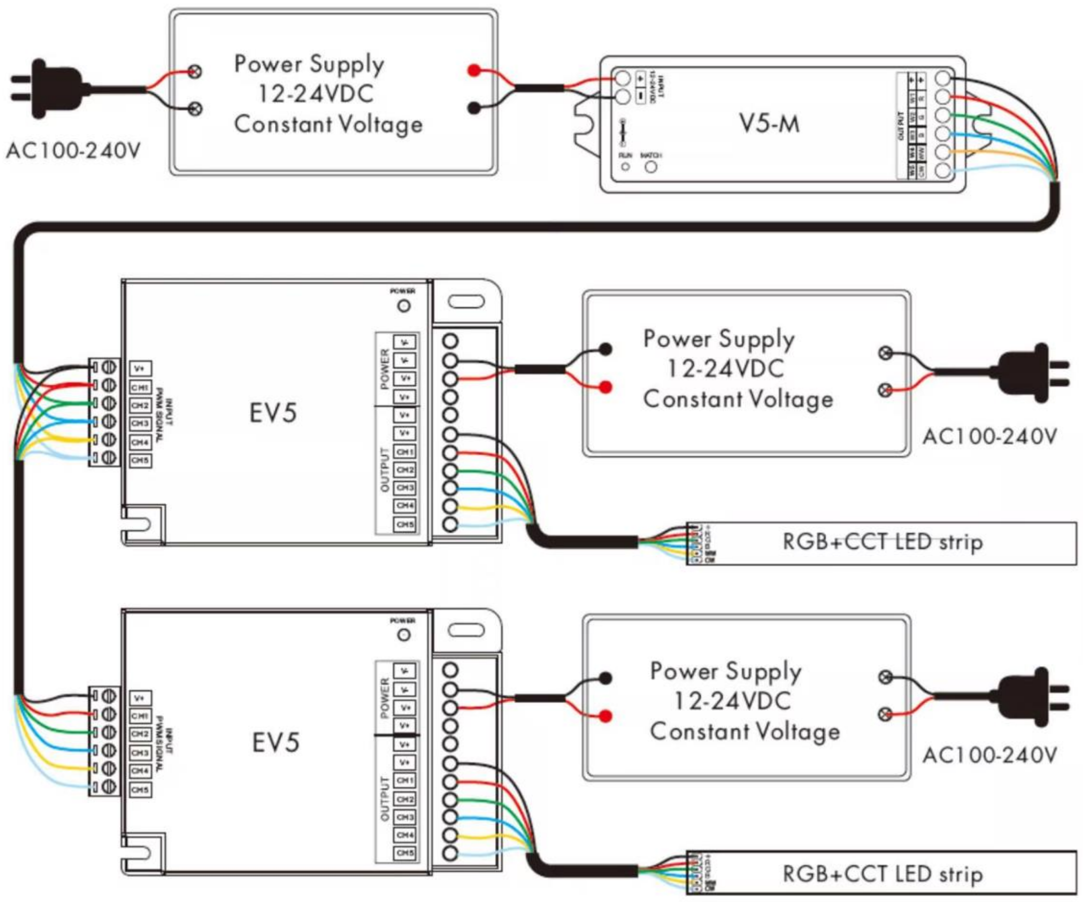
Wring RGBW LED strip lights with LED controllers

Without PWM amplifier



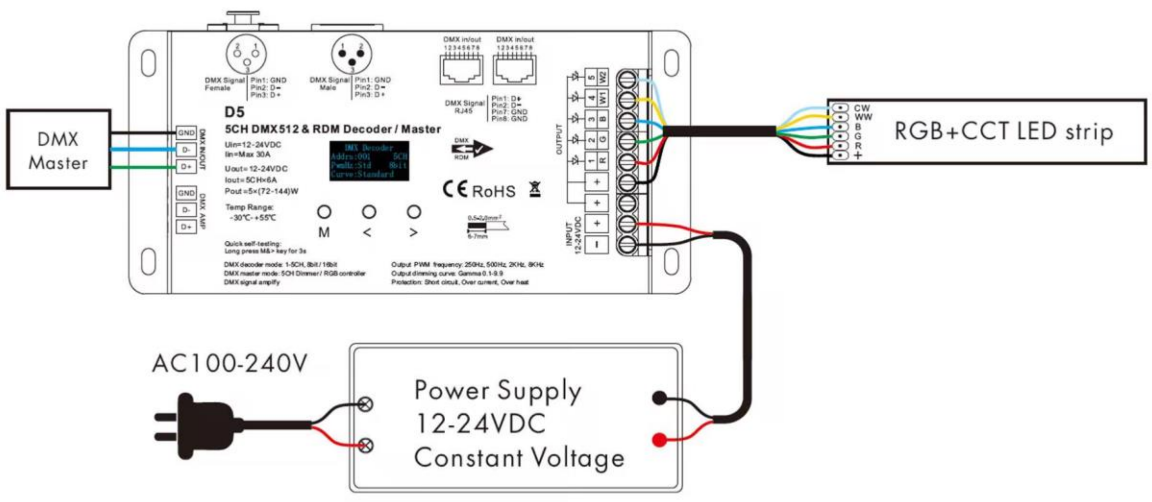
rgbcct led strip controller without amplifier connection diagram

With PWM amplifier



rgbcct led strip controller with amplifier connection diagram

Wring RGBW LED strip lights with DMX512 decoder



rgbcct led strip dmx512 decoder connection diagram

How to wire addressable LED strip lights

Individual addressable led strip, also called digital led strip, pixel led strip, magic led strip, or dream color led strip, is a led strip with control ICs that allow you to control individual LEDs or groups of LEDs. You can control a specific part of the led strip, which is why it is called 'addressable'.
For more information, you can read The Ultimate Guide To Addressable LED Strip.

How to wire SPI addressable LED strip lights

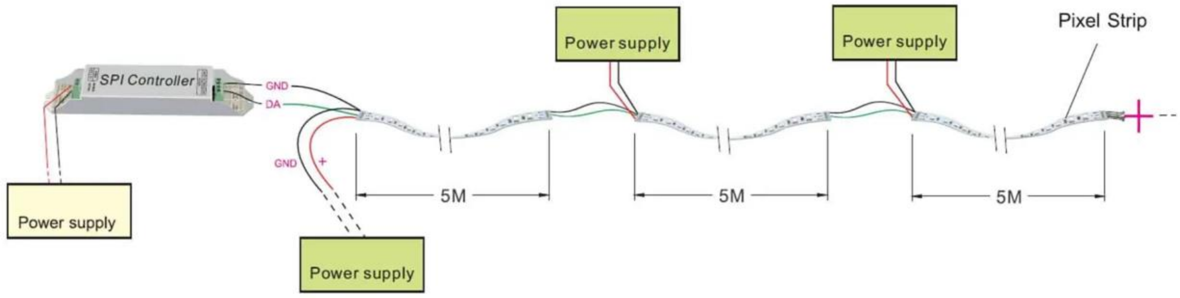
The Serial Peripheral Interface (SPI) is a synchronous serial communication interface specification used for short-distance communication, primarily in embedded systems. The interface was developed by Motorola in the mid-1980s and has become a de facto standard. Typical applications include Secure Digital cards and liquid crystal displays.

The SPI addressable led strip is an LED strip that receives SPI signals directly, and changes the color and brightness of the light according to the signal.



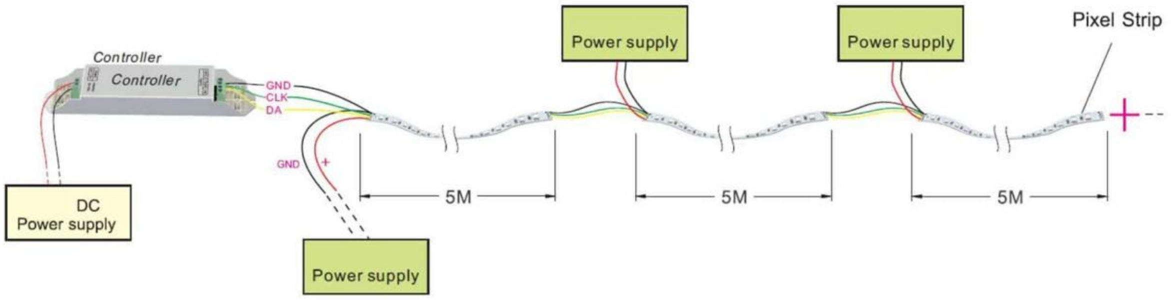
spi addressable led strip light

SPI addressable LED strip lights with data channel only



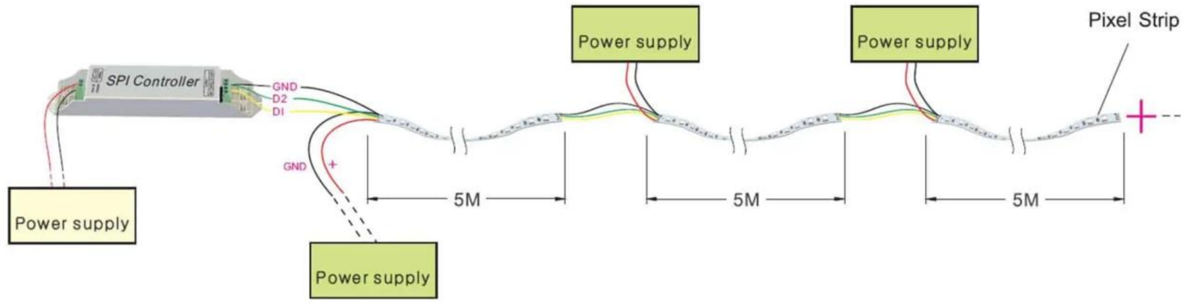
spi addressable led strip with data wire only connection diagram

SPI addressable LED strip lights with data and clock channels



spi addressable led strip with data and clock wire connection diagram

SPI addressable LED strip lights with data and backup data channels



spi addressable led strip with data and backup data wire connection diagram

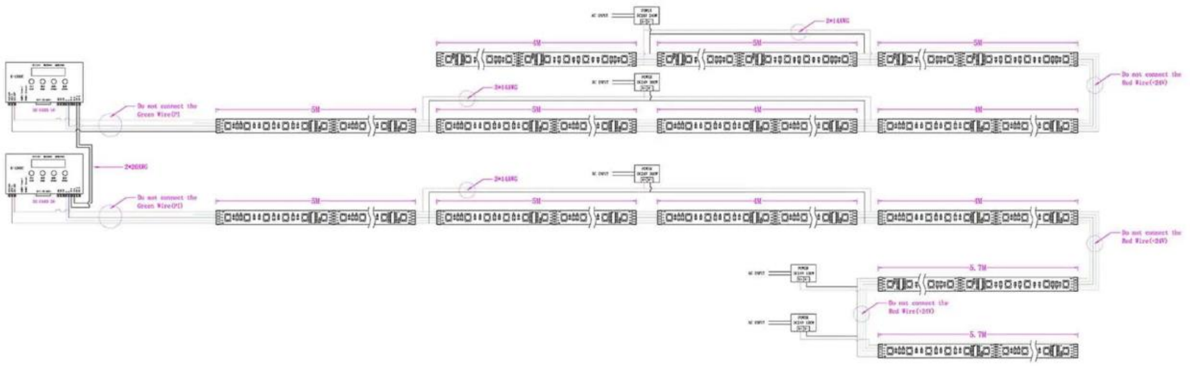
How to wire DMX512 addressable LED strip lights

The DMX512 addressable led strip is an LED strip that receives DMX512 signals directly, without a DMX512 decoder, and changes the color and brightness of the light according to the signal.



dmx512 addressable led strip light

Before using the DMX512 addressable LED strip, you need to set the DMX512 address to the LED strip, and this operation only needs to be done once.



dmx512 led strip wiring diagram

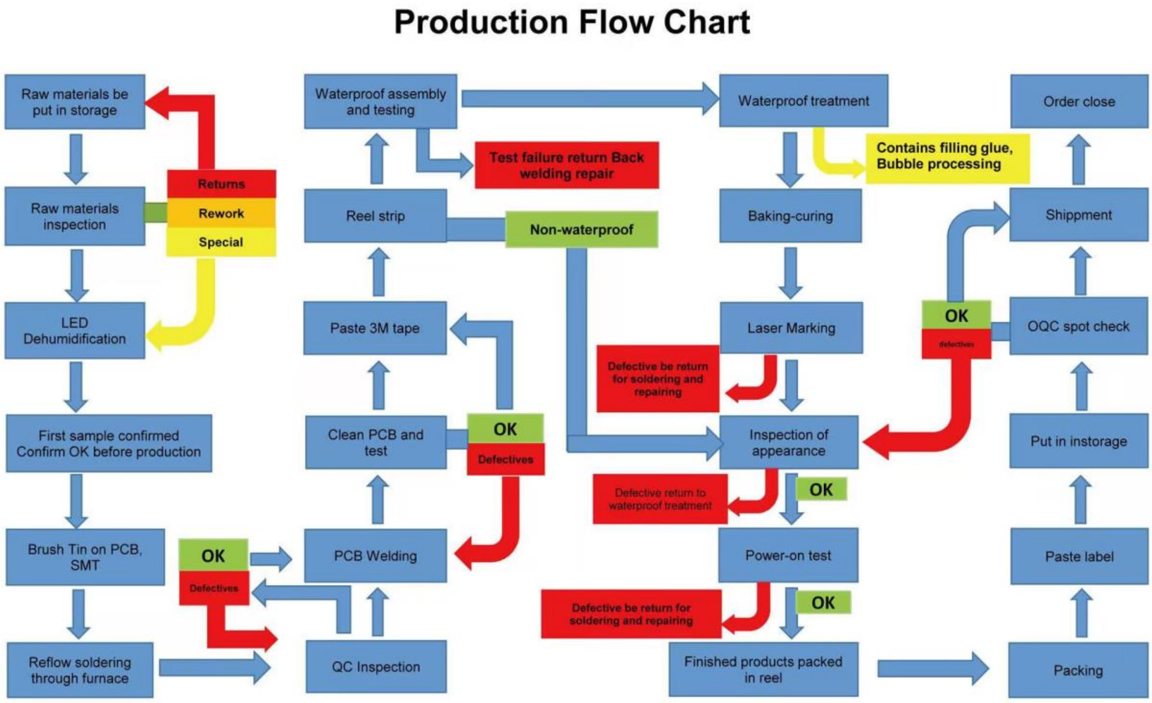
You can download the dmx512 led strip wiring diagram PDF version.

LED Strip Light Production Flow

In this article, we will take a look at the production process of LED strip lights. We will start with a brief overview of the manufacturing process, then we will move on to a more detailed description of each step in the production process.

I attached a production flow chart to give you a general idea of the process.

For easy viewing, you can download the PDF version.



Raw Materials be Put in Storage

After the raw materials arrive at our factory, they will be stored in our transit warehouse. After the raw materials are tested and passed, they will be transferred to our official raw material warehouse.

Raw Materials Inspection

Our raw material quality inspectors will conduct a complete inspection of the raw materials. If the raw material passes the inspection, it will be transferred to the official raw material warehouse, otherwise, it will be returned to the raw material supplier.



Raw materials inspection

LED Dehumidification

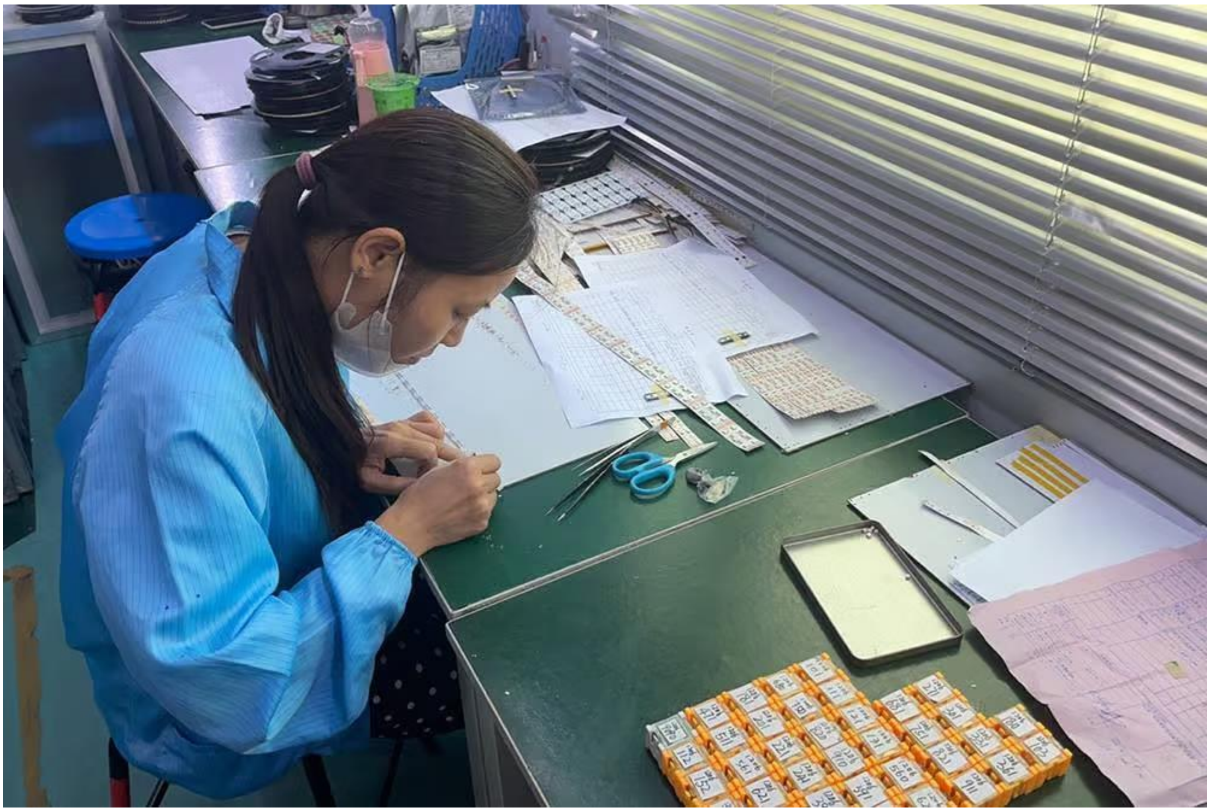
Before the LED lamp bead is used in production, it needs to be dehumidified, otherwise, the LED lamp bead will be damaged by moisture when the LED lamp bead is reflow soldering.



LED dehumidification

First Sample Confirmed

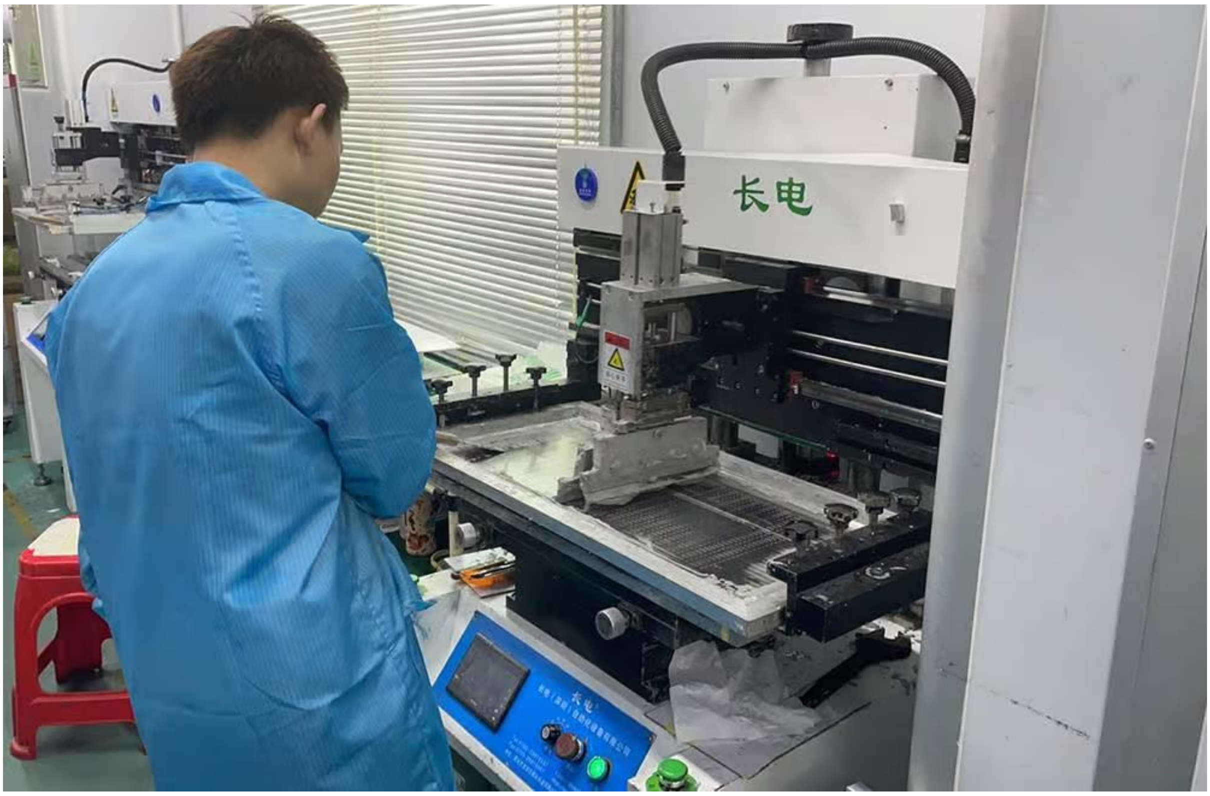
Before mass production, we need to make a sample from raw materials. We will run various tests on this sample. Only if this sample passes these tests will this batch of raw material be used for mass order production.



First sample

Brush Tin on PCB, SMT

We will brush solder paste on the PCB, and then attach the lamp beads, resistors, and other components to the PCB.



Brush tin on pcb



SMT

Reflow Soldering Through Furnace

When the SMT is completed, the PCB with the lamp beads attached will be sent to reflow soldering. After reflow soldering, the lamp beads, resistors, and other components will be soldered to the PCB.



Reflow soldering

QC Inspection

Our inspectors will inspect the appearance of the PCB and light up the LEDs to ensure that the LEDs, resistors, and other components are properly soldered to the PCB.



QC inspection after reflow solering

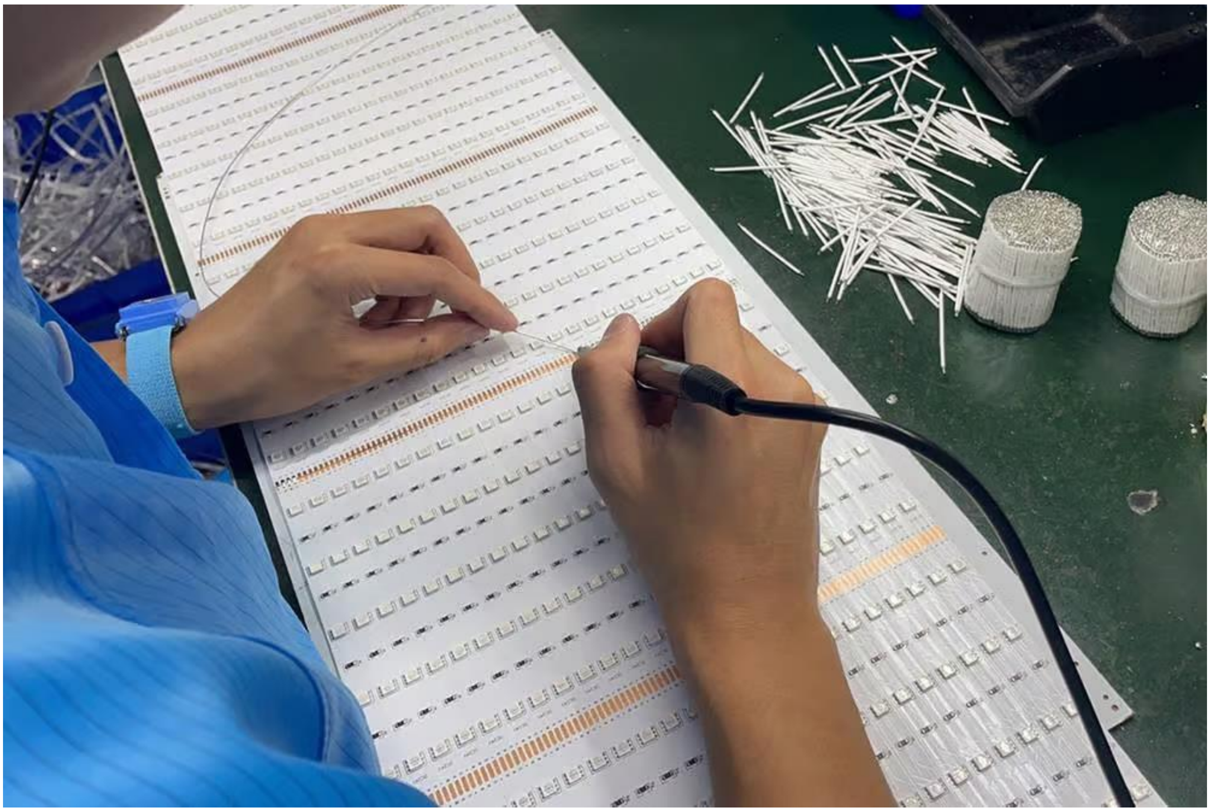
PCB Welding

After SMT is completed, our PCB is 0.5 meters each. The regular length of our product is 5 meters, so we need to solder the PCB to make it into a 5-meter roll.

This step, for small orders, we will do it manually, otherwise, it will be done by machine.



PCB welding by machine


PCB welding by hand

Clean PCB and Test

The soldering place of the PCB will be a little dirty, we need to clean the place where the PCB is soldered. Then we check and light up a 5-meter LED s trip to make sure it’ s working properly.



Clean pcb



Test after clean PCB

Paste 3M tape

In most cases, we will stick 3M double-sided tape on the back of the PCB.

Reel Strip

The LED strips are rolled onto a plastic reel. For non-waterproof LED strips, it is usually 5 meters rolled onto a plastic reel. If it is a waterproof product, it will be rolled onto a large reel, waiting to be transferred to the waterproofing treatment.



Paste 3M tape and reel strip

Waterproof Treatment

For waterproof LED strips, we use the most advanced silicone extrusion process.

Silicone integration extrusion is when the LED strip lights and solid silicone are extruded together through a mold and are shaped by high-temperature vulcanization.

Baking-Curing

After the LED strip light and the silicone are extruded together, they will pass through a high-temperature oven, and then the silicone will be cured by vulcanization.

For detailed information about silicone extrusion, please visit What is silicone integrated extrusion?



Silicone integrated extrusion

Laser Marking

We will use a laser to mark the model, production date, CCT, Voltage, Wattage, and other information on the product.



Laser marking

Inspection of Appearance

Our quality inspectors will check the appearance of the products to ensure that the label information and appearance of the products are correct.

Power-on Test

Our quality inspectors will light up each LED strip to ensure that they can work properly.


Power on test

Finished Products Packed in Reel

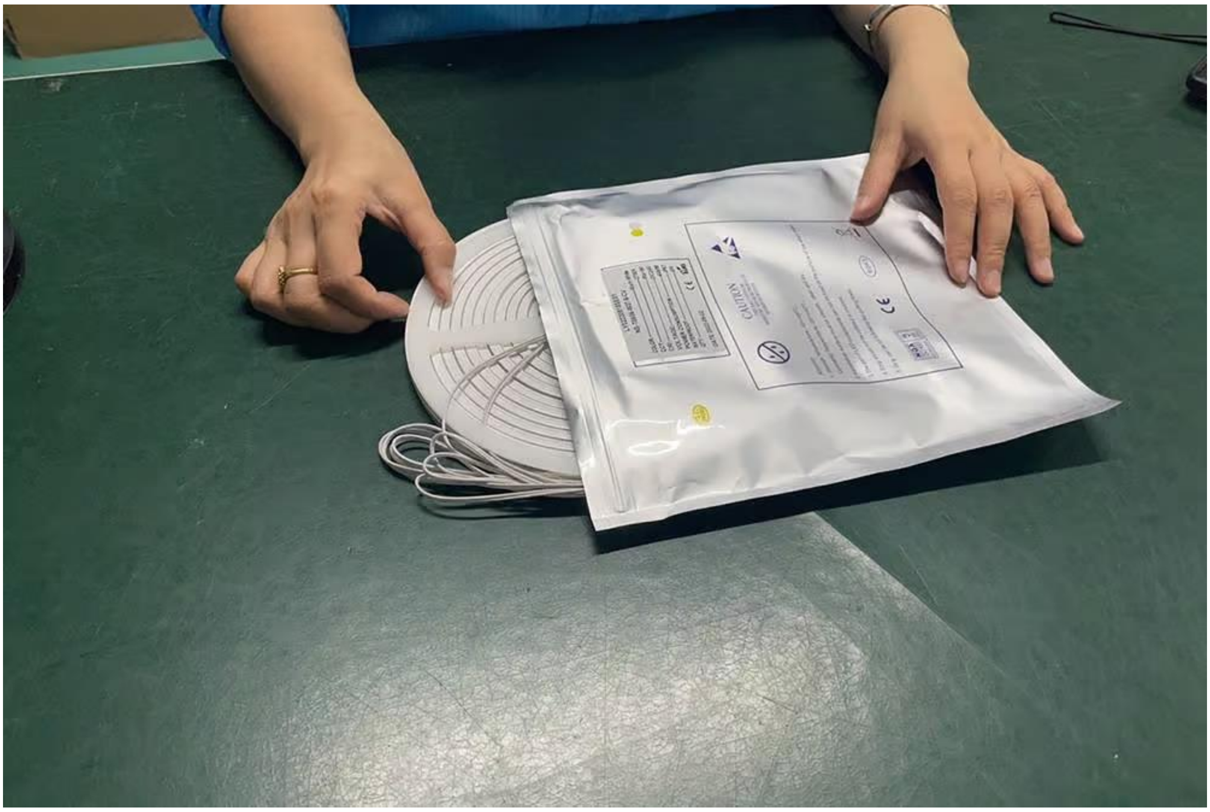
The finished LED strip is rolled onto a plastic reel, usually 5 meters per roll.

Packing

Then each roll of LED strips will be packaged in an anti-static aluminum foil bag.

Paste Label

A label is attached to the outside of each anti-static bag.



Packing into bag and label

Put in Storage

These packaged LED strips will be stored in our warehouse, waiting to be sh ipped.

OQC Spot Check

Before the LED strips are shipped, our quality inspectors will also randoml y check them for quality. Only LED strips that pass the OQC spot check will be sent.

Shipment

We will send the LED strips according to the customer’ s shipping requireme nts (by express, air, or sea).

How To Install LED Strip Lights on the Ceiling?

Currently, LED strip lights are among the most in-demand and enticing components of decorations for most occasions. They are an excellent choice for aesthetic purposes since they produce a fantastic lighting and illumination effect when the light is reflected from a flat surface.

Ideally, you need to prepare the surface by eliminating dust and dirt, stick the LED strip to the surface, cut the additional length, and secure the strip with a layer of sellotape or transparent tape.

This article illustrates the complete process of LED strip light installation on your ceiling. You can install strip lights at your home, office, or premises.

Pre-Requisites

Having the appropriate equipment for your project is crucial whether you’re a professional electrician or a novice LED installer. Check out the tools below to see what you’ll need to install your LED strips correctly.

1. A Wire Cutter

The installation of wiring to LED strip lights is made simpler with the help of a wire cutter, which is essential for cutting and stripping 16-22AWG stranded wires to appropriate lengths.

2. Screwdrivers

One of the most crucial things to have during installation is a tiny flathead or Phillips screwdriver because most LED components require them.

3. Voltage Tester

A voltage tester is an efficient tool for investigating your electronic connections. Using this equipment, one can quickly determine the electrical potential difference between two places in an electric circuit.

4. **Heat Shrink, Electrical Tape, and Wire Connectors**

Whether using wire nuts or electrical tape to connect the wire and apply heat shrink, it's crucial to use suitable connectors when mounting an LED project.

5. **A Soldering Iron (Optional)**

A cheap soldering iron will be a good investment if you intend to work with LED strip lights because you can cut and reconnect the strips to the precise lengths needed for your project.

Required Skills & Some Points To Ponder

A novice isn't recommended for LED strip lights installation without expert supervision. Although the process is simple, you should still have the following basic skills to achieve a smooth installation.

- Working with strips isn't everybody's figure tip. Prior to operating with the electrical wires, having an exact thought regarding their functions is fundamental. It's critical to have some essential information on utilizing the proper hardware and connecting the correct links in the position.

- Clients can favor interfacing at least two outings to a solitary power source. It's fundamental to have a two-way power splitter to head towards involving an isolated power connector for fueling the Drove strips. Prior to initiating work with the connector, it's vital to check that the wattage of the strips doesn't exceed the connector's complete result limit (total output capacity).

Having an exact vision of these connectors and careful steps before utilizing them essentially. Posting down the similarity of the strips and the connector ought to be thought of. The client ought to know the associating method of the splitter to the connector before connecting it to the attachment.

- Procuring information about the apparatuses expected during establishment is fundamental. The sort of apparatus utilized in the technique is wire stripper, voltage testers, screwdrivers, electrical tapes, a

nd many more.

- An estimating tape can be utilized to gauge the border of the surface for introducing the strips. An exact estimation will help with giving a faultless focus on the oriented surface.

The LED strip lights are managed concerning the length of the surface with some scissors. It’ s smarter to cut the strips following two copper dots in tended toward the finish of LED units. In any case, managing from these spo ts won’ t hamper the electrical conductivity of the strip.



Safety Precautions

Here are some safety tips you must follow while installing LED strip lights in your home or anywhere else:

- The LED strips may become stained with paint while the walls are bein g finished or when renovation work is being done. As a result, the le d chip’ s light’ s hue gets degraded.

- The LED strip must be removed carefully. Avoid pulling the strip so hard that it snaps, and avoid applying excessive pressure to the LED chips because doing so will cause them to crack, exposing the "holes" in the strip's light line.

- It is crucial to choose the strip at the designated spots; otherwise, a section can be interrupted, which would cause the LEDs to burn out.

- Correctly position the curves on the strip. Following suitable curvature rays and adhering to the upper and lower limits outlined in the guidelines is crucial.

- Respecting the voltage specified in the led strip's usage instructions is crucial. The device will be permanently harmed if a 24V led strip is connected to a 220V system.

- Use LED strips with the correct IP rating because an item with the right level of protection is necessary for the LED strip's durability.

Step-by-step Installation Guide

Below are complete instructions for installing LED strip lights. But before proceeding to the installation, please test your LEDs to ensure they're operational.

1. **Measure the Length of the Strip That Will Be Used**

Estimate how much LED illumination you'll require. Measure each position if you plan to put LED lights in various spots so you can later cut the lighting to fit. Then purchase enough strip lighting to cover the length entirely. The most well-known strip lighting manufacturers are LEDYi and Phillips Hue.

Both businesses produce fully programmable RGB (red, green, and blue) Bluetooth-controlled lights. Even numerous strips can be synced to match one another. Corsair has intriguing strip lights if you want something bolder and thicker than the thin light strips. Avoid the addressable RGB lights if you

need simple white LEDs to save money.

2. Wash the Surface Before Installation and Dry It

The area where the strip lights will be installed should be cleaned with a clean cloth. If any residue or dirt needs to be removed, use vinegar, soap, or water. If it’s wet, thoroughly dry the area. This will guarantee a smooth and long-lasting attachment of the adhesive strip. You can install LED strips on plastic, wood, metal, or vinyl. Any flat, smooth surface will do. Strip lighting should not be installed on painted drywall or textured surfaces like orange peel since the glue eventually starts to peel off.

3. Remove the Sticker-Like Adhesive Strip’s Backing

If you haven’t already, unpack your strips. Do not unravel the strip; keep it wound on the circular spool. Pull the backing off the first 6 to 18 inches by undoing the very end of the spool, depending on how much you want to start with. The light strips come in a single piece, although attaching large amounts at once can be tricky. Do not speed up the adhesive application process because doing so will reduce its effectiveness.

4. Cover the Surface with the Strip Lights

Start by planning where you will plug the strip in. Carefully place the first portion of the strip against the wall, desk, cabinet, or whatever surface you’ll be mounting the lights on. With the help of your hand, flatten the strip and firmly press down on the area. If necessary, you can use an extension cord, but it will be simpler if you immediately start near the outlet you intend to use. If there is a slight bend or gap, don’t be concerned. The strip will remain in place as long as the vast majority of it is adhering to a spotless surface.

5. Keep Removing Backing Until the Entire Area is Covered

Continue to open the reel and remove the backing as you go. Apply firm pressure as you press each segment of the strip lighting into the surface. Work slowly and try to keep the lights as straight as you can. Take your time, a

nd pay close attention to any corners you need to work around. If you have to navigate around a corner, take your time and try to fully press the adhesive of the strip into the area where the edges meet. Press the strip back to the center line where you're placing the lights if you find yourself straying off course. It's usually relatively easy to work with this stuff.

6. Use Scissors to Trim Any Extra Strip of Lighting

For instructions about where to cut to prevent harming the lights, check the manual that came with your strip lighting. Every 2-3 inches, there are typically gold threads or scissor markings where you can securely trim the lights. Cut off and discard the surplus light sections.

7. Attach the LED Strips to the Controller and Plug Them In

In the outlet, insert the power brick included with the light strips. The controller unit should then be attached to a surface by removing the adhesive backing. Please feel free to leave it undisturbed if it rests on a surface, such as the inside of a cabinet or an end table. Place the controller in a hidden location if you don't want it to be seen.

Quick Tips for Smooth LED Strip Lights Installation

Here are some quick tips to keep in mind while installing LED strip lights. Don't forget to follow these tips to experience the best LED lights and avoid any damage.

- Prior to beginning the establishment strategy, going through the establishment of the product is fundamental. Gaining management over the significant marks of the item lessens the gamble of any debilitation. Then again, ill-advised changes can likewise bring about a flawed set up.

- Make sure there are no signs of damage on the new bulb or light strings. This involves keeping an eye out for diode failures, exposed wire, and fractures. Your replacement bulb may malfunction due to any of these problems.

- Double-check the area where you intend to install the lightbulb or string of lights. Make sure they are away from children or your pets if they are inside. Never overcrowd it with anything that may catch if the bulb breaks. Instead, leave some space between pieces of furniture.

- Be sure to remove the old bulb after switching off the electrical power if replacing any existing bulbs. Because the bulb still receives an electrical current when the light switch is on, doing so is never safe.

- Positioning is crucial when using LED holiday lights or business string lights, especially on roofs or in difficult-to-access locations. So before attempting to mount a ladder and hang string lights, devise a plan on paper.

- After ensuring everything is in place and having one final review, you can connect to a light source. To test a lightbulb in your home, all that is necessary is to turn the knob or press the switch.

There are a few things you may do to protect your family in case of an emergency at any time:

- Always keep supplies in your house that can be used to put out fires or treat injured people with first aid. This includes first aid kits that are well supplied and fire extinguishers.

- If you have an electrical emergency, such as a fire or an injury, turn off the power immediately. This entails disconnecting the appliance from the wall or turning off the power at the electrical box.

- Immediately dial 911 if you or a family member is harmed or your home is on fire. While you wait for emergency services to arrive, leave the house. Call an electrician to have those things looked at if you’re having any electrical problems that you think might cause an emergency.

How To Install LED Strip Lights On a Boat?

Want to make your boat feel like floating in the magical world? Go for LED strip lighting; these are waterproof, low-voltage, durable light fixtures ideal for interior, exterior, and even underwater boat lighting. But how to install them on your boat?

A suitable LED strip, connector, controller, and driver- are all you need to light your boat. The first step to installing LED strips on your boat is to get a waterproof LED strip. In this case, IP rating is a crucial factor to consider; higher ratings indicate better waterproofing. Next, you must go through sizing, connecting, mounting, and finally, powering up the strips. In this process, considering the voltage of the power outlet is crucial, as LED strips are sensitive to voltage ratings.

But no worries, in this article, I have brought you a stepwise procedure for installing LED strips in the easiest way possible. And for your convenience, I’ve also added a guideline to purchase the ideal strip for your boat and many more. So, without any further delay, let’s jump into the discussion-

6 Simple Steps To Install LED Strips On Boat

Installing LED strips on your boat is not rocket science. You can quickly install them by following the below step without any professional help-

Step-1: Purchase Suitable LED Strips For Boat Lighting

Besides choosing the color and pattern of LED strips, IP rating is the most crucial factor for boat lighting. Going for a higher IP rating is a must for keeping your light fixture safe when it comes in contact with water.

If you want colorful boat lighting, go for RGB LED strips. You can choose plain white or color temperature adjustable strips for decorating the boat’s interior. In the latter half of this article, I’ve added a complete guide to selecting suitable strips for boats. So read the full article to get the best deal.

Step-2: Selecting & Preparing The Installation Location

The lighting requirement of different sections of the boat is different. For instance, if you light the boat' s bow, you will require red and green stripes. So, it is crucial to consider the lighting area before mounting strips.

Select the location and clean the area to ensure the strip' s adhesive sticks perfectly to the surface. If there is dust or dirt, the adhesive will come off, and the strip light won' t stay longer. Here, you can use a wet cloth and rub it with alcohol for proper cleaning. But before installing the fixtures to the surface, ensure it is completely dry.

Step-3: Taking Measurements & Sizing The LED strips

Measure the area to find how many strips you require. Now, cut your strips as per the needed length. Cutting the strips is super easy; using a scissor, you can quickly complete this step. Besides, if there is any wrong sizing, you can reconnect them using an LED strip connector or soldering. To know the correct procedure for cutting LED strips, check this- Can You Cut LED Strip Lights and How To Connect: Full Guide.

Step-4: Mounting The Strips

After sizing the LED strips, now it' s time for installation. Take the LED strips and remove the adhesive backing. Press the strips to the desired location to ensure they stick properly. In other cases, you may use screws or clips to make this installation more firm. But in boat lighting, avoiding screwing as drilling will damage the boat surface. For more information, you can read Installing LED Flex Strips: Mounting Techniques.

Step-5: Power It Up

You will require a compatible LED connector wire and a driver to connect the mounted LED strip to the power source. Now, follow the below steps to power up the strips-

- Take the connector wire and insert the red wire to the LED strip' s positive '+' marking and the black wire to the negative '- ' markin

g.

- Remove some adhesive backing from the strips and press the connecting clips to close the claps.

- Connect the other end of the connecting clip to the LED driver.

- Now, plug the LED driver into the main power supply. The LED strips usually run in low voltage, 12V or 24V, and match this rating with the driver and power source.

Step-6: Check The Connections

After the driver is connected to the power supply, it's time to light the LED strips. Turn on the main switch, and the light will glow up. In case the lights don't turn on, check the connections. Ensure the polarity is ok and the joining points are correctly connected. Try again fixing these issues; the light will surely glow.

Therefore, following these steps, you can quickly install LED strips on your boat.



Areas To Install LED Strips On A Boat

You will get multiple options to light up the boat with LED strips. Here are some areas which you can pop up while lighting your boat-

Interior Boat Lighting

The boat's interior includes room for sleeping, a washroom, a kitchen, a wheelhouse, and the surrounding areas. Here are some ideas for a light boat interior-

- Cabin Lighting: Add LED strips to the ceiling of your boat cabin. You can go for cove lighting; it works excellent for indirect lighting effects. This will act as the general lighting of the room. For accent lighting, install the strips underneath cabin furnishings or counters. This will also work great for task lighting.

- Wheelhouse: Try installing LED strips along the steering and seat of the boat caption. You can experiment with adding them to outline the

front glass of the chamber.

- Storage Lighting: This area is where you keep all your essentials like- a boating rod, net, etc. Install strips inside the storage bay will help you find your needs.

- Galley Lighting: The kitchen area of boats is known as the galley. It is a brilliant option to use LED strip lights in this area to improve your onboard cooking experience.

- Stair Lighting: You can elevate the boat interior by adding LED strips along stairs and ladders. It will provide accent lighting to the stairs and help you avoid unexpected accidents.

- Washroom Lighting: The boat's washroom is very small, so LED strips are the best option to keep the space minimal. You can add these strips along the ceiling or around the bathroom vanity mirror.



Exterior Boat Lighting

The exterior area includes the concave surface of the boat. Here are some fantastic ideas where you can install LED strips to highlight the boat exterior-

- Deck Lighting: Place the LED strips under the boat's rails or outline the surface to highlight the deck area. This will add accent lighting to your boat, giving a mesmerizing look at night.

- Hull Lighting: The hulk is the watertight enclosure of the boat that protects the machinery, cargo, and passenger accommodations. This area is uplifted and more visible from the outside. So, you can focus your boat by adding bright color LED strips to the hull. Try color-changing RGB strips; this will give your boat a playful appearance.

- Signage Lighting: If you have a private boat or yacht, you can backlight your boat's name to highlight its signature style. In this case, LED neon flex works best.

Underwater Boat Lighting

Underwater lighting makes your boat feel like floating in a magical world. Place the LED strips at least six inches below the waterline to ensure the light falls underwater. In this case, choose strips with IP68 ratings; they are waterproof and support submerged water. For underwater lighting, blue, green, and purple LED strips are more popular. However, you can experiment as per your preference.

Navigation Lighting

Navigation lights are essential to provide visibility to your boat position at night to prevent a collision. These lights are placed in the front region of the boat, known as the bow. Two color lights are used for bow lighting for navigation-

Red Light: Use the red light on the port (left) side

Green Light: Install green light on the starboard (right) side

This color lets the surrounding boat know the ship's position while floating in the water. You can easily add such lighting to your boat using RGB LED strips.



Advantages Of Using LED Strips For Boat Lighting

Here are some features or benefits of LEd strips that make them suitable for boat lighting-

1. **Energy Efficient:** LED strips use 75% less energy than other traditional forms of lighting. So, installing these fixtures on your boat will save you energy costs.

2. **Safe Thermal System:** LED strips have a heat sink that prevents the fixture from overheating. Besides, they are low voltage and shockproof, making them ideal for use in areas like boats.

3. **Versatile Color Options:** You will find various coloring options when lighting your boat with LED strips. They have adjustable and DIY colo

r lighting variants also. In the latter segments of this article, I've added more details about the LED strip options. So, keep reading.

4. **Multiple Applications:** LED strip lights and ambient lighting suit the boat's general task. You can use them inside the cabin, on the stair case, on the deck, or even underwater boat lines. Besides, they work excellently for navigation lighting.

5. **Dimmable:** The dimming feature of LED strips allows you to adjust the lighting effect to your requirement. For instance, if you are fishing at night, you can increase the brightness of deck lighting. And when chilling in the boat and wanting to create a soft lighting glow, dim the LED strips to your desired level.

6. **Waterproof:** LED strips are available in different IP ratings. The higher ratings are waterproof and can resist powerful water splashes. Some can even withstand submerged water.

7. **Long Lasting:** For durability, LED strips stand next to none. They can last longer than other traditional light fixtures. And if maintained properly, you can use them for about a decade.



Disadvantages Of Using LED Strips For Boat Lighting

Besides all these above benefits, there are also a few disadvantages of LED strips for boat installation. These are as follows:

1. **High Installation Cost:** The installation of LED strips costs more when compared to traditional light fixtures. But they are more cost-effective considering the maintenance, repair, and durability.

2. **Voltage Sensitivity:** The LED strips require accurate voltage ratings to perform. If the voltage is not the same from end to end of the strips, the lighting doesn’t maintain constant brightness. Due to this problem, you may find some parts of your boat lighting dimming gradually as the strip’s length continues.

3. **Not for Use in Cold:** As LED strips don’t emit much heat, they can’t melt the snow. So, when installed in cold weather, they get covered by snow, which hampers their function.



Best LED Strip Option For Boat Lighting

For lighting your boat with LED strips, here are the following options you can find-

- **Single Color LED Strip**

Monochrome strips are known as single-color LED strips. They are suitable for installation at any part of the boat. These strips are available in red, blue, yellow, green, pink, amber, UV, and more.

- **Color Temperature Adjustable LED Strips**

You can choose tunable and dim-to-warm LED strips for boat interior or cabin lighting. Installing them will allow you to cancel the ambiance of your boat from warm to cool lighting tones.

- **RGB LED Strip**

Nothing works best to add a playful vibe to boat decor, like RGB LED strips. These LED strips have 3-in-1 LED chips that can create about 16 million hues by mixing the three primary colors- red, green, and blue. Using a smart controller, you can also produce DIY light colors. These strips will work

great for lighting the boat' s deck, hulk, or railings.

- **Addressable LED Strip**

Want to take your boat lighting game to the next level? Go for addressable LED strips. These light fixtures can produce rainbow lighting effects and sync with the music. So, having these lights for yacht parties would be excellent.



Things To Consider Before Purchasing LED Strips For Boat Lighting

The considerations for purchasing boat lighting are different from general lighting requirements. So, to help you out, I' ve listed a few factors which you can follow to choose the suitable LED strip for lighting your boat-

IP Rating

As the boat faces weather conditions like wind, scorching heat, storms, rains, and continuous contact with water, lighting for the boat requires greater protection. And that is why IP rating is the most crucial factor to consider here. IP stands for [Ingress Progress](). It is a two-digit number where the first digit indicates protection against solids like - dirt and dust, And the second digit indicates protection against liquid like- rain, water splash, etc. Higher the IP rating better protection it provides. Here are some IP ratings suggested for lighting different areas of the boat-

Lighting Area Of Boat	Recommended IP Rating	Protection Level
Boat Cabin Lighting	IP64 or IP65	As this part of the boat doesn't come in contact with direct water, a lower Ip rating will be enough. It will provide complete dust and light splash water protection.
Deck Lighting	IP66	Full protection against dust and powerful water jets.
Hull & Navigation Lighting	IP67	Complete dust protection and full immersion up to 1 meter.
Underwater Lighting	IP68	Supports submersion

Color

Choosing a boat's light color gives you the freedom to listen to your heart. However, it is essential to install red and green LED strips for navigation lighting. Choosing other colors will not work here, as the following colors indicate the left and right sides of the boat.

But you can choose any color that meets your preference for general and accent lighting of your boat. Yet, bright colors LED strips like blue, red, and green are better choices to give more visible lighting. Besides, you ca

n select color-changing strips like- RGB or addressable LED strips for the boat exterior. And warm color lights or adjustable strips like tunable or dim-to-warm will work for boat cabins. Again, if you have a private yacht, going for plain white or soft sea blue LED strips can give an aesthetic and modern outlook.

LED Density

LED strip density means the number of LED chips mounted per meter. Choosing less-density strips will create dots, and the lighting effect won't be up to the mark. So, for seamless boat lighting, choose high-density LED strips. LEDYi offers customization facilities on LED density, so you can get whatever you want.

Length

LED strips are usually available in 5-meter reels. You can cut these strips to your required size. And if you need longer strips, joining them using an LED strip connector is also possible. But here, connecting multiple strips together causes a voltage drop. And to prevent this, it requires extra wiring. So, choosing Super Long Constant Current LED Strips is a wonderful decision for long strip installation. They can cover up to 50-meter distances without any cutting hassle. To know more about LED strip lengths, check this article- What Are the Longest LED Strip Lights? However, LEDYi also offers customization facilities. You can contact us if you have any particular length requirements for your boat.

Voltage

LED strips are low-voltage light fixtures that make them ideal for boat use. They usually come in 12V or 24V. And these ratings are ideal for boats as higher voltage can be dangerous near water.

Warranty

Warranty is always a crucial factor to consider to ensure better lighting quality. As boat lighting often faces a splash of water, the LED strips have a higher chance of shutting off if the quality is not up to the mark. So, get proper knowledge about warranty policies before purchasing LED strips. H

owever, no worries with LEDYi; we provide 3 to 5 years of warranty on our premium LED strips.

How to Install Stairway Lighting with LED Strip Lights?

Regarding stair lighting, nothing can look more modern and classy than LED strip lights. But how to install them on the stairway?

The flexibility and customizing features of LED strips give you unlimited options to install them on stairs in the most creative way possible. You can mount them on the steps, bottom/side of the treads, walls/ceiling of the stair, and more. The installation process is quite simple here, as the strips come with adhesive backing. Yet you can go for other methods like clipping or using aluminum channels.

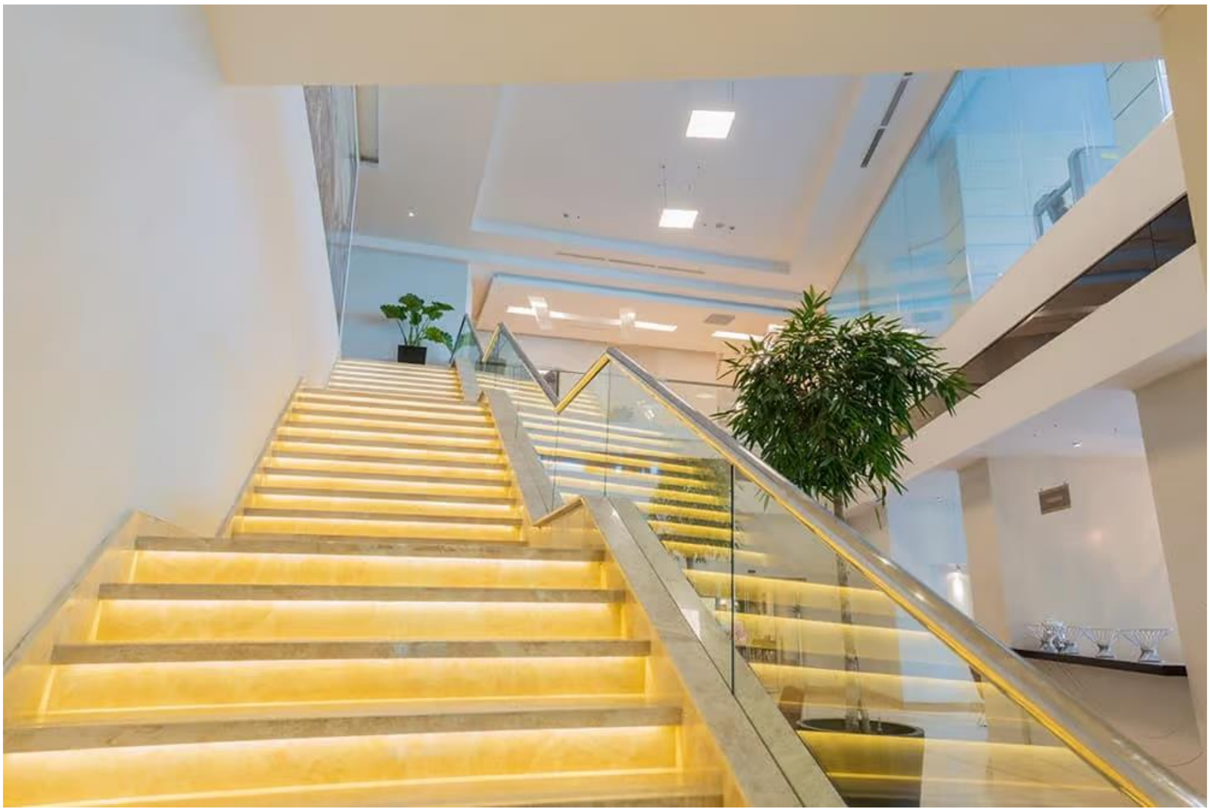
So, if you plan to install LED strips on the stairway, you are just at the right place. In this article, I have bought you a complete guideline on installing LED strips on stairs, ways to choose the right strip, its maintenance process, and more. So, let's get started-

What Is Stairway Lighting?

Stairway lighting means illuminating the staircase using different types of light fixtures. The main purpose of stair lighting is to ensure proper visibility to avoid accidents while stepping on the stairs. Besides, visibility also enhances the outlook of the stair area.

A stairway can be divided into many parts like- the tread, raiser, railings, landing, nosing, etc. Considering all these zones and lighting them in a planned way, you can create an outstanding ambiance for your stairway. Different types of light fixtures are suitable for stair lighting; for example, spotlights, LED strip lights, recessed lights, or even bulky chandeliers for stairwell ceilings. You can choose the one that suits your stair best, yet LED strips are currently the most popular option for stair lighting. And

so in this article, I will share with you all the ins and outs of installing the most trending stair lighting option, LED strip lights.



Why Choose LED Strips For Stairway Lighting?

Among hundreds of lighting options for the stairway, why choose LED strips? The most straightforward answer is that LED strip lights bring the most magical ambiance to your stairway. And as these are flexible, you can easily install them in different sections of the stair to bring your desired lighting outcome. Apart from these, there are many other reasons to choose LED strips; these are as follows-

Energy-Efficiency

The LED technology used in LED strips makes them super energy efficient. They use almost 85% less energy than traditional light forms like incandescent bulbs. Thus you can use LED strips for lighting the stairs of both residential and commercial areas. Turning them for a long time will not put a heavy burden on your electricity bills. Besides, these fixtures don’t overheat or produce harmful gasses like mercury. So, LED strips are also an environmentally-friendly lighting option.

Advanced Features

You can upgrade your boring stairs into advanced ones with LED strips. These light fixtures offer you color-changing features and dimming options. So, you can change the entire ambiance of your staircase according to your mood. For instance, if you are having a family dinner, warm yellow-tone lighting on your indoor stairs will go well with the environment. Again when you are having a party, changing the stair color to red or blue with RGB strips will be a game-changing move. And to take this lighting game to the next level, you can install motion-sensor LED strips; your guests will be amazed each time they step on your stairs.

Customizable

If you are looking for customizable lighting options for stairway lighting, nothing can beat LED strip lights. You can cut them to the size of your stairs and install them wherever you want. (check this article for the LED strip cutting process- How to Cut, Connect, and Power LED Strip Lights). Besides, options are available to customize the voltage, power consumption, IP ratings, and more. All you need to do is find a reliable strip manufacturer-LEDYi is your best choice for customizing LED strips. We offer customization, ODM, and OEM facilities.

Ideal For Indoor & Outdoor Stairs

LED strip lights have many IP ratings suitable for indoor and outdoor stair lighting. By purchasing lower IP-ratified strip lights, you can illuminate your indoor stairs, and going for a higher rating will protect your outdoor stair lighting from unfavorable weather conditions like rain, storm, dust, or wind. And most importantly, these fixtures are shock-proof and corrosion-proof, which makes them more suitable for all types of stairs. You can install them on the stair railings without worrying about electric shock. These are cool to the touch, making them an excellent choice for creative stair lighting. For more information, you can check A Guide to Waterproof LED Strip Lights.

Easy Installation

LED strips come with an adhesive backing which makes the installation quick and simple. All you need to do is clean the stairs, target the area, remove the adhesive backing, and press it to the stair- that’ s it! However, for extra protection, especially for outdoor stairs, you can go for clipping or use aluminum channels. Thus, installing LED strips on stairs is super easy; you don’ t need to call an electrician. For more information, you can check Installing LED Flex Strips: Mounting Techniques.

Modern Look

LED strips are your ultimate solution to give your stairway a modern outlook. The hidden lighting effect created by LED strips brings a sophisticated look to your stairs. Installing these lights in your house stairs will add a wow effect to your interiors. Besides, for the stairs of commercial areas, like restaurants or hotels, LED strips can be a move to grab public attention. The illumination stairs can be a great spot for photogenic customers, which will play an effective marketing strategy.

Things To Consider Before Purchasing LED Strips For Stair Lighting: A Buying Guide

When you purchase LED strips for stair lighting, here are some facts that you should consider to get the ideal one-

Type Of LED Strip

LED strips can be of different types; each varies in lighting output and color variation. The most popular types of LED strips for stair lighting include-

1. Single Color LED Strips

Single-color LED strips are your ideal choice if you want a basic LED strip. It is the most plain form of LED strips you can customize in multiple ways. You can also get your desired wattage and voltage to get your required brightness for the stairs.

2. Tunable LED Strips

Tunable LED strips are excellent and most versatile LED strips for white lighting. With these strips, you can adjust the stair lighting of your house from warm to cool tones of any temperature. For instance, if you want cool white lighting for your stairs, increase the color temperature, and when you want cozy lighting, simply switch it to a warmer setting.

3. Dim-To-Warm LED Strips

If your entire house is decorated with warm theme lighting, dim-to-warm LED strips are an excellent option for your stairs. Installing these stripes, you can get different shades of warm lighting, yellowish to orangish, to create a cozy ambiance. These strips will also go well with the stairs of fine dining restaurants with a warm and welcoming atmosphere. For more information, you can check What is the Difference Between Dim to Warm LED Strips and Tunable White LED Strips?

4. RGB LED Strips

For colorful stair lighting, RGB LED strips are your ultimate choice. These strips contain 3-in-1 chips that can produce more than 16 million hues combining three primary colors- red, green, and blue. Going for RGB LED strips is an excellent option if you want colorful lighting on your stairs.

5. Motion Sensor LED Strips

Motion sensor LED strips are the most viral stair lighting option. Installing these fixtures can give your stair a modern and high-tech ambiance. Motion sensor strips detect and use infrared rays to identify any moving body stepping into the stairs and illuminate it instantly. If you have a smart home, these strips on the stairs will complement your house best.

Color Temperature

The color temperature of the LED strips determines the light’s tone. If you want to create a warm ambiance for your stair area, use a lower color temperature. This will give a yellowish-to-orange tone. Again if you want cool lighting, choose LED strips with higher color temperatures. However, tunable or dim-to-warm LED strips are your best choice if you want an adjustable color temperature option.



Color Tone	Color Temperature
Warm Tone	2700K and 3000K
Cool Tone	3500K and 4100K
Daylight	5000K and 6500K

For more information about color temperature, you can check How to Choose LED Strip Color Temperature?

Brightness

The brightness of the light fixture is usually measured in lumen. Higher the lumen rating, the brighter the light it produces. You should first determine the brightness you require for the stair lighting and decide on purchasing the strips accordingly. Remember, going for higher brightness than your requirement will cost you more both on fixture purchasing and on electricity bills. Check out Candela vs. Lux vs. Lumens to learn more about different brightness units.

Length

Usually, the LED strips come in 5 meters per reel. But other options are also available; the length per reel can extend up to 60 meters for different voltage ratings. Check this article to know more about strip lengths- What Are the Longest LED Strip Lights? However, to get customized sizes for your strip, contact LEDYi.

Density

The LED density is an important consideration for choosing LED strips. It determines the lighting effect. For instance, going for low-dense LED strips will create dots that may not be appealing. For even and flawless lighting, always go for highly dense LED strips. However, the preference is up to you; many of you may like the dot effect. But remember, with the increase in density, the price of the LED strip will also increase.

If you need a completely dot-free lighting solution, you can choose COB LED strip. To learn more about COB LED strip, please check the article All you need to know before buying COB led strip.

Voltage

Typically LED strips come in two voltage variants- 12V and 24V. Also, you can check How to Choose The Voltage of LED Strip? 12V or 24V? But as you increase the length of the LED strips by joining them, a voltage drop occurs, hampering the light output. Though it can be solved by additional wiring, the process becomes much more difficult. That is why LED strips of Constant Current LED Strip with higher voltage ratings are ideal for large stair lighting. This series of LED strips has the following voltage rating-

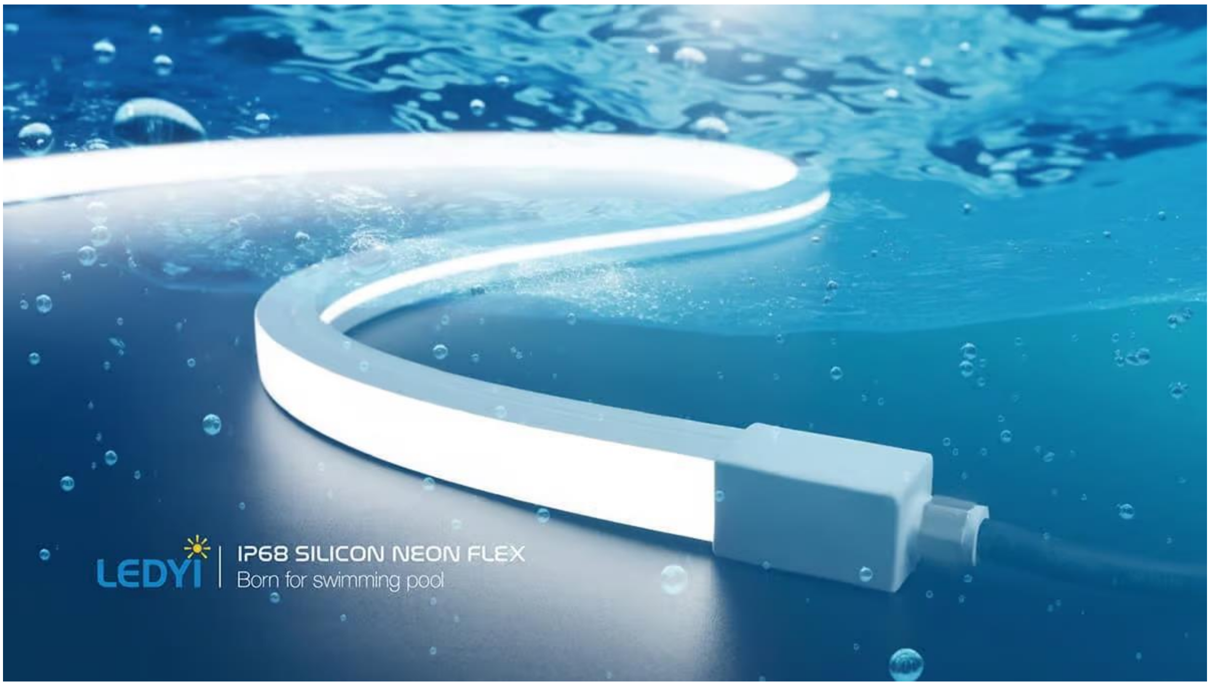
- 48Vdc@50meters
- 36Vdc@30meters
- 24Vdc@20meters

Installing these strips on your stairs gives you constant brightness without any voltage drop. However, there are High voltage Driverless AC LED Strips too that can provide you with higher voltage- AC110V/120V/230V/240V.

IP Rating

The IP rating is a crucial factor to consider when purchasing LED stripes for any kind of application. The rating will vary depending on whether you are installing the LED strip on an indoor stair or outdoor stair. IP rating determines the degree of protection against ingress. If you plan to install LED strips for indoor stairs, a lower IP rating of IP20 or above will work. Again, for outdoor stair lighting, a higher IP rating of IP44 or IP65 or higher is most effective.

But don’t make the mistake of getting higher IP-rated LED strips where not necessary; this will be nothing but a waste of money. Consider the surrounding environment before choosing the ideal rating. For instance, if you want to light the stairs of a pool, then IP68 is your ultimate choice. It will provide complete water resistance and illuminate the strip even under water. But these extreme protection levels are not required for the indoor stair of your house. To get the proper guideline in choosing an IP rating, check this article- IP Rating: The Definitive Guide.



ip68 silicone neon

Controlling Features

You can control LED strip lights in several ways with LED controller. You can have a switch controller or remote-controlling system. The advanced LED strip lights now also support mobile controlling systems. So, you can easily adjust the light setting of your stairs with your mobile phone. Besides, motion sensor LED strips are another option worth mentioning here. You need not turn them on or off; they are completely automated.

Customizing Option

The LED strips available in the market may not fulfill your lighting requirements. In this case, find a manufacturer that can offer customization facilities. [Contact LEDYi]; we offer you customization options on power consumption, voltage, IP rating, length, LED density, and more.

Warranty

Warranty somehow indicates the quality of the LED strips. So, always find LED strips with better warranty policies. Our LED strips offer you three to five years of warranty. At this time, if you face any issues with our product, feel free to contact us.

Installing LED Strips On Stairway

Installing LED strips on the stairs is quick and simple. You don't need to be a professional electrician to install them. Here I have listed a stepwise procedure to help you install LED strips on the stair-

Step-1: Choose The Ideal LED Strip

The very first step in installing an LED strip on your stair is choosing the right kind. Consider your stair location- indoor or outdoor, determine the required brightness, length of the strip, and voltage, and purchase accordingly. In this case, the guide discussed above will help you to choose the ideal one.

Step-2: Select The Location

Decide where you want to install the LED strips; it can be the ceiling, railing, steps, or stair tread. Once you have chosen the location, clean the area with a damp cloth. It is important to ensure the satire is free of dust and dirt. If there is any dirt in the installation area, the adhesive backing of the LED strip will not stick properly.

Step-3: Measuring & Cutting The LED Strip

Once you have cleaned the stair, take a measuring tape and determine how many strips are required for the installation. For instance, if you are installing LED strips below each step, measure the length of each step and cut the strip accordingly. You will find cut marks in the strip; use scissors and cut following the mark. In case you make a wrong cut, don't panic. You can quickly join them back using the LED strip connector. To learn the procedure, check this article- Can You Cut LED Strip Lights and How To Connect: Full Guide.

Step-4: Polarity Matching

After cutting the LED strips to appropriate measurements, it's time to prepare them for installation. For that, first, place the LED strips, connectors, and wirings properly to maintain accurate polarity. That is, the positive marking should meet the positive endings and negative to the negative. Ensuring this is important because if the polarity is incorrect, the LED strips will not glow.

Step-5: Soldering

After matching the polarity, connect the components, including the dimmer and power supply/ driver, with LED strips by soldering. However, a better alternative to soldering is the LED connector. These are clips that make the connecting process quick and straightforward. However, soldering is preferable if you are installing LED strips on outdoor stairs as it gives a more robust connection.

Step-6: Testing

Testing the LED strip is necessary to ensure the wirings are proper. After you are done with soldering and connecting the LED strips to the power supply, turn it on to check if it glows. If it doesn't glow, check the polarity and connections. Don't make the mistake of installing the LED strips without testing them. If you install it and then find the strip is not working, all the hard work will go in vain.

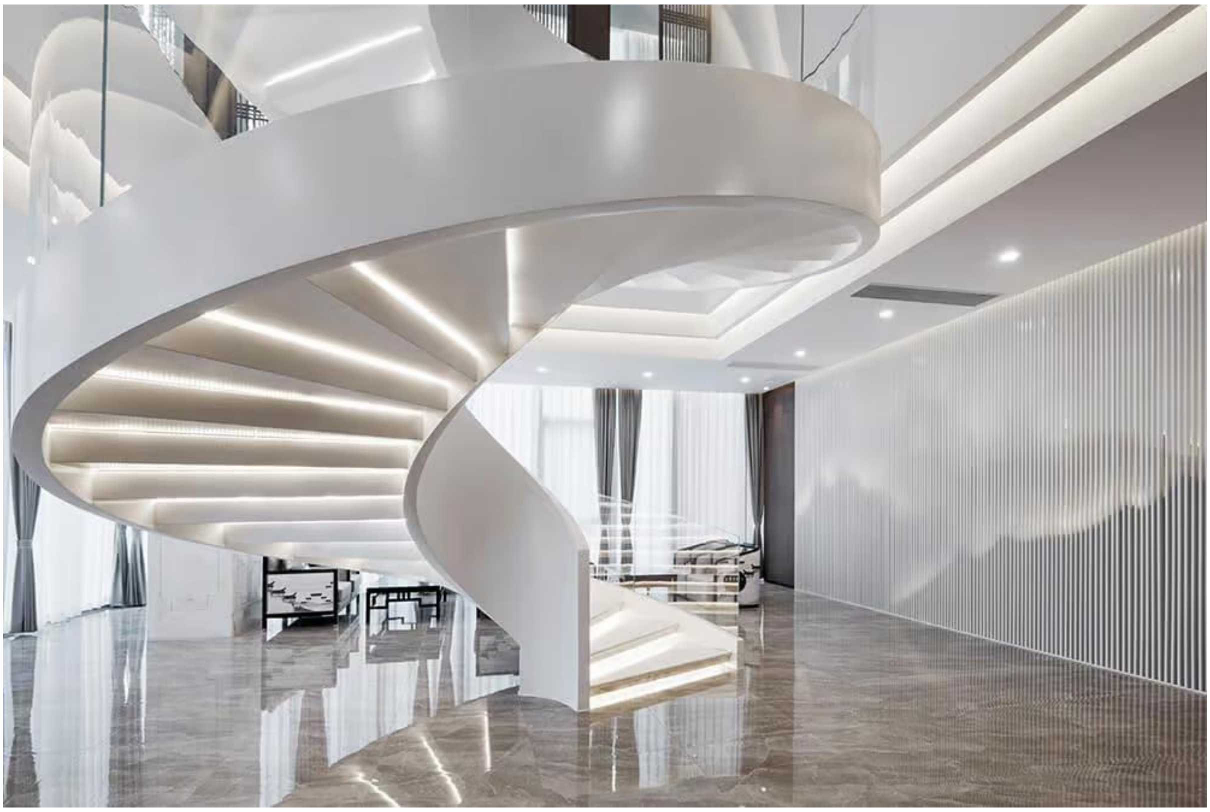
Step-7: Mounting The LED Strips To The Stairs

Now take the LED strips to where you want to install the LED strips. Remove the adhesive backing and press it to ensure it sits properly. LED strips have 3M tape that is strong enough to hold the fixture right on the stair points. Yet, if you want to strengthen the installation, you can use clips and screw them to the stair.

Step-8: Turn On The Power Source

Your installation is done once you have mounted the LED strips ensuring proper wiring. Now, turn the power source and watch your stairs glowing!

Following these steps, you can quickly install LED strips on your stair. However, it is better to hire an electrician to ensure proper installation of outdoor stair lighting.



Where To Install LED Strips On Stairway?

When lighting the stairs with an LED strip, you may get confused about deciding where to install it. The flexibility of LED strips allows you to insta

ll them anywhere. Yet I am suggesting some ideas where you can design them, but the option is unlimited here. You can take an idea from the below suggestion and bring your derided lighting output to your stair-

- **The ceiling of the stair:** You can install LED strips on the ceiling of the stairs as cove lighting. This style suits you best if you have a duplex or triples stairs at home. Create a false ceiling and install the LED strips creating a hidden lighting effect. This will work as a general lighting of the stairway.

- **Below each tread:** You will get space to install the LED strips under each stair tread. This will illuminate the stair and create an aesthetic accent lighting.

- **Along the side of the tread:** If you are not having side walls in your stair, or at least one side open, installing LED strips along the side of the tread is a great option. This will illuminate the side angles and focus your stairway from a distance.

- **Middle of each step:** Installing LED strips in the middle of each step is another amazing idea for lighting stairs. Usually, strips are mounted all along the step, but to be creative, you can leave space from two sides of the step and install LED strips right in the middle.

- **Below the grove or lip along the wall:** If your stairs have a grove or lip, you can install the LED strips below it.

- **Underneath the handrail:** As LED strips are shock-proof, do not get overheated, and usually run under lower voltage, they are completely safe to use on stair railings.

So, to install LED strips, you can choose any of these locations that suit your stair. However, there are endless options to get creative here.

Ways To Mount LED Strips On Stairway

You can mount the LED strips on stairways following any of the below processes that suit you best-

Adhesive Backing

LED strip lights come with 3M adhesive backing tapes. This makes the installation process easy; even a child can install the strips using the adhesive backing. All you need to do is remove the tape cover and press it to the stair; that is it! To learn more about LED strip adhesive tapes, read this article- How to Choose The Right Adhesive Tapes For LED Strip.

Clipping

Another option for installing LED strips is using clips. There are plastic and metal clips available; some common categories of LED strip clips include-

- One-side bracket fixing clip
- Angle adjustable clips
- Clips with adhesive backing
- E-Clips

Before deciding to use a clip, remember that you will need to drill the stair, which can damage the stair permanently. However, clips with adhesive backing are an ideal option here.

Aluminum Channel

As the stair continuously faces impact or footsteps, aluminum channels are a good option for installing LED strips. Aluminum channels can be of different types to fit your stair lighting; these include-



aluminum profile

1. **Surface mount channel**

Surface mount channels are the plainest category of aluminum channels for installing LED strips. These are ideal for installing LED strips in the middle of steps or any plane surface of stairs.

2. **Recessed mount channel**

Recessed mount channels are your best option if you want built-in lighting for your stairs. To use this method, you must install the channels early when you build the stairs.

3. **Angled mount channel**

To light stair areas like- below the tread or any other corner of the stairs, you need to place the steps in the angular direction. In this case, angled mount channels are an excellent option for mounting LED strips.

If you want to learn more about these mounting methods, read this article- Installing LED Flex Strips: Mounting Techniques.

Maintenance Tips for LED Stairway Lighting

LED strips don't need much maintenance. Yet you can practice some regular keep-on to extend its durability. Here are some basic maintenance that you should follow for stair lighting with LED strips-

Clean regularly: As the stair continuously goes through foot movements, undoubtedly, it deals with dirt daily. Accumulation of this dirt on LED strips will hinder even and clear light flow. Besides, dust settlement can damage the fixture if you get lower IP-rated strips. So, maintain a regular cleaning to ensure proper functioning. However, don't go for wet cleaning unless the LED strips have water-resistance properties.

Check on voltage: Extending the length of LED strips along the stairs can cause a voltage drop. Check the light's brightness; if the illumination is decreasing gradually, contact an electrician.

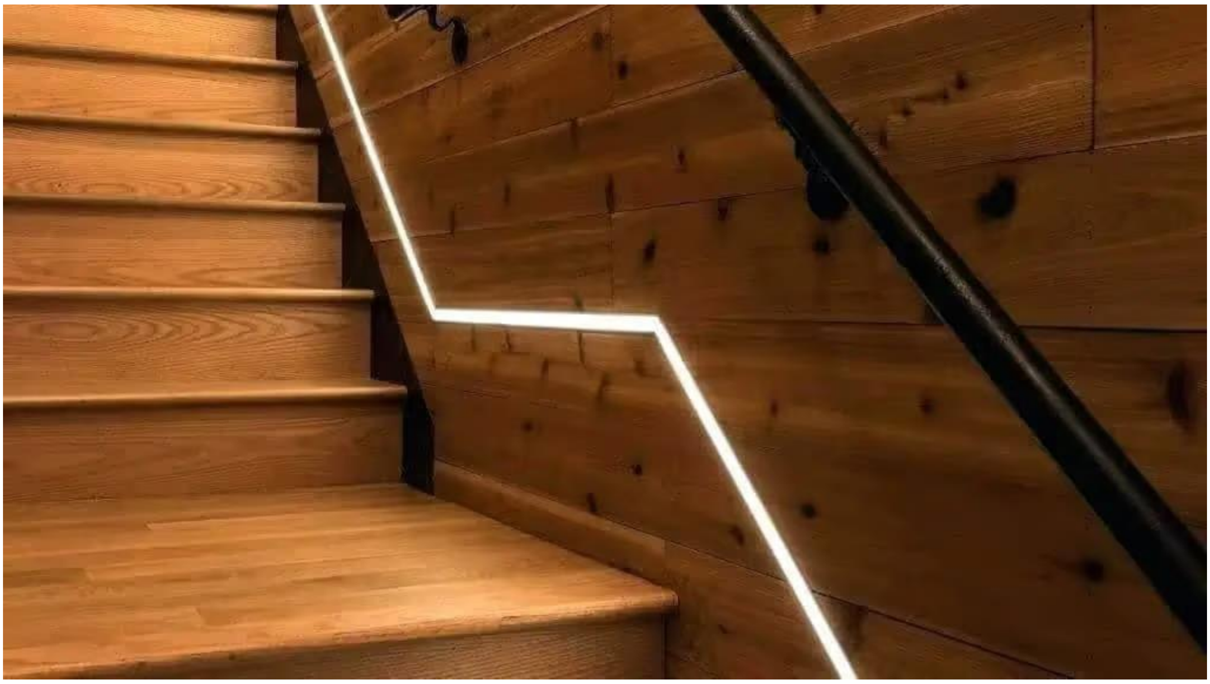
Switch off when not required: Don't let the stair lights glow for the entire day. Turn them on only when you need to, like at night or if you are having guests at home. This will make the LED strips last longer and save electricity bills.

Creative Stairway Lighting Ideas With LED Strips

Instead of going for common lighting ideas with LED strips, you can go creative by mounting them in unique styles. Here are some unique ideas for you-

- **Dynamic Structure on Stair Walls**

To give an aesthetic appearance to your stairways, you can design dynamic patterns on the side walls of the stair. In this case, use recessed mount aluminum channels to get the desired outlook.



- **Use Colorful LED Strips**

Instead of choosing plain white LED strips, you can choose RGB LED strips to bring a colorful effect to your stairs. You can design rainbow theme stairs or combine different color strips to bring an ombre effect.



- **Hidden Stair Lighting Effect**

You can use the LED strips to give your stairs an indirect and sophisticated hidden lighting effect. Doing cove lighting for the ceiling or installing LED strips below the tread can help you get this effect. However, add the strips underneath each step if you have an open riser staircase- the result will amaze you!



You can check my- [16 Stair Lighting Ideas With LED Strip Lights] to get more stair lighting options. In this article, I've covered the most amazing stair lighting suggestions you can implement for indoor and outdoor stairs.

10 Common Mistakes to Avoid When Installing LED Strip Lighting

Thanks to their energy efficiency, flexibility, and adaptability, LED strip lights have become a popular choice for various lighting applications like task lighting, accent lighting, and ambient lighting. However, installing these lights can be challenging, and mistakes during installation can result in poor performance, reduced lifespan, and even safety hazards. This comprehensive guide will discuss 10 common mistakes to avoid when installing LED strip lighting, ensuring a smooth and efficient installation process.

Mistake 1: Selecting the Wrong Type of LED Strip Lighting

The first mistake many people make when installing LED strip lighting is choosing the wrong type of strip. With various LED strip lighting options available, each with unique features and specifications, choosing the right strip that meets your specific lighting needs is essential. Consider indoor or outdoor use, brightness levels, and color temperature before selecting.

Mistake 2: Using an Inappropriate Power Supply

Another frequent mistake is using an incompatible power supply for LED strip lighting. Choosing a power supply that can accommodate the voltage and wattage requirements of your LED strip lights is crucial, as using an unsuitable power supply can damage the lighting system and pose safety risks.

Mistake 3: Neglecting to Use Proper Connectors

Using appropriate connectors is essential for ensuring the proper functioning of your LED strip lighting. When installing LED strips, it’s crucial to use connectors specifically designed for LED strip lights, guaranteeing correct and secure connections.

Mistake 4: Failing to Measure Accurately

Taking precise measurements ensures your LED strip lighting fits perfectly in your space. Mistakes during the measuring process are common, so double-check your measurements before cutting your LED strip lights.

Mistake 5: Cutting LED Strip Lighting Incorrectly

Improper cutting of LED strips can damage the lighting system and negatively impact performance. Ensure you cut your LED strips at the designated cut points to avoid issues.

Mistake 6: Inadequate Mounting of LED Strip Lighting

Proper mounting is vital for the performance and longevity of your LED strip lighting. Use the correct adhesive or mounting brackets specifically designed for LED strip lights, and make sure they are securely attached.

Mistake 7: Overlooking Environmental Factors

When installing LED strip lighting, it’s essential to consider the environment in which the lights will be used. Select the appropriate type of strip lighting for specific conditions, such as waterproof LED strips for outdoor or humid environments.

Mistake 8: Ignoring Dimming and Control Options

Another common oversight is not considering dimming and control options for your LED strip lighting. Adding a dimming feature or selecting a strip ligh

ting system with built-in controls can significantly enhance the versatility and usability of your lighting installation.

Mistake 9: Compromising on Quality Accessories

Investing in high-quality accessories, such as power supplies, connectors, and mounting brackets, is essential for the performance and lifespan of your LED strip lighting. Avoid the temptation to save money by choosing low-quality accessories, which can lead to poor performance and potential safety hazards.

Mistake 10: Not Seeking Professional Assistance When Necessary

If you need more certainty about any aspect of your LED strip lighting installation, feel free to consult a professional. A qualified electrician or lighting expert can provide valuable advice and ensure your installation is safe and efficient.

How to Choose The Voltage of LED Strip? 12V or 24V?

The common voltages of LED strips are 12VDC and 24VDC, and their prices are the same. When you are ready to purchase LED strips, you may have questions, what is the difference between 12VDC strips and 24VDC strips? Which one should I choose?

LEDYi generally provides both 12VDC and 24VDC LED strips. Under normal circumstances, the difference between a 12VDC LED strip and a 24VDC LED strip is not too big, as long as you choose the correct power supply.

If you need a shorter cut length, we recommend choosing a 12VDC LED strip. For the LED strip with the same LED quantity, the cut length of the 12VDC L

ED strip is half of that of the 24V LED strip. This gives you more flexibility to cut the LED strip to the length you want.

If you need a longer linear run and higher luminous efficiency, we recommend choosing 24VDC LED strips.

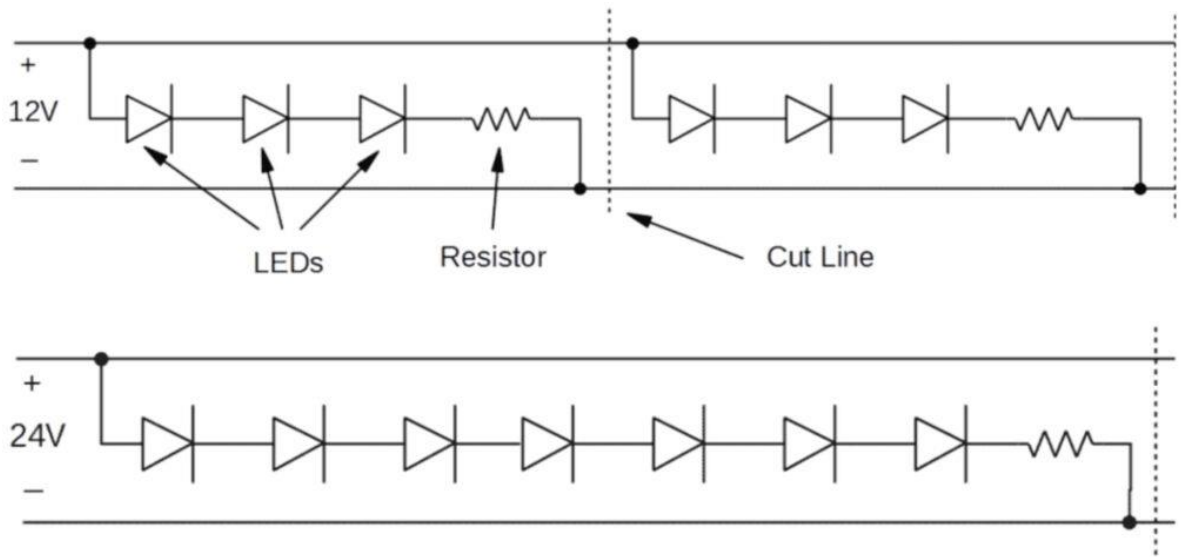
If you’re curious to learn more about the technical aspects, read below for more differences:

12VDC LED strip with shorter cut length

Most individual LED chips run on 3VDC power regardless of whether they are mounted on a 12V strip or a 24V strip. In fact, the same LED chip that works on a 12V strip could also be mounted on a 24V strip. What makes the difference is how the strip circuitry is designed.

LED Strips are wired in groups of LEDs. The size of the group depends on the voltage of the strip. A 12V strip has 3 LEDs, and a 24V strip has 6 LEDs or 7 LEDs, even up to 8 LEDs. The cut lines are located between the groups. Therefore, the smaller each group of LEDs, the closer together the cut lines can be.

For example, see the diagrams of 12V and 24V strips below:



A lower voltage 12VDC strip with closer cut lines may be good if your installation has many corners with short lengths. This can help to minimize the “dark” zone at the corners.

To get the advantage of the Long Run of the 24VDC LED strip and the shorter cutting length of the 5VDC LED strip, we have developed Mini Cutting LED Strip, 1 LED per cut at 24VDC.

12V LED strip has a wider range of application scenarios

On the other hand, 12 VDC is a common voltage, so LED strip compatibility may eliminate the need for additional power supplies. For example, if you are installing lights in a vehicle, a 12 VDC LED strip light can often be directly connected to the existing electrical system. While there are certainly exceptions to this, and it is important to check your existing system before making a purchase, 12V LED strips can offer a more convenient installation solution in many cases.



24V LED strip, longer linear run

A higher voltage strip will generally be able to have longer runs without suffering from the effects of voltage drop.

What is voltage drop?

Voltage drop causes LED strips to lose their intensity as they become longer. LEDs at the beginning of the strip (nearest the power supply) will shine brightly. In contrast, LEDs at the end of the strip will have a dimmed appearance.

Why does voltage drop happen?

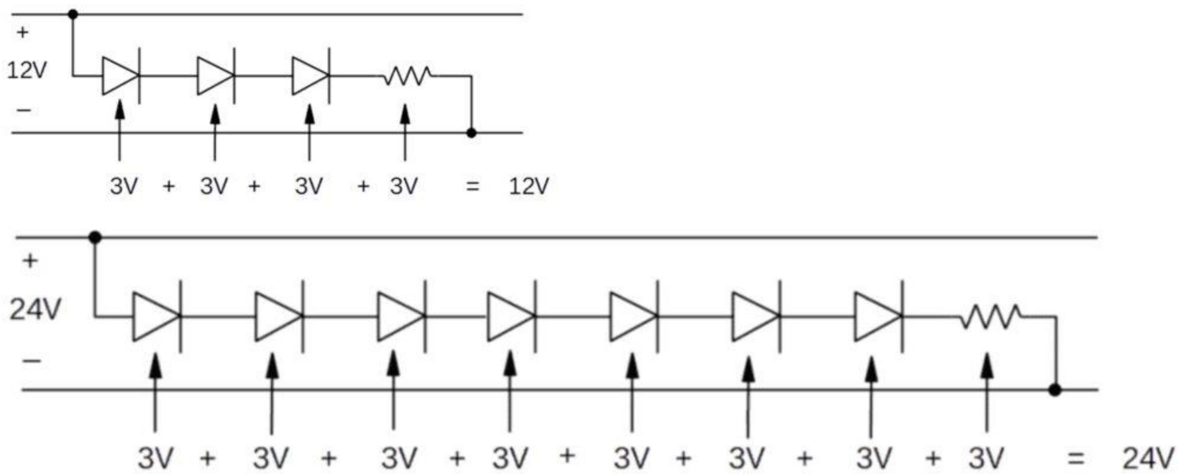
Any length of wire has a certain amount of electrical resistance. The longer the wire, the more the resistance. Electrical resistance causes voltage drop, and voltage drop causes your LEDs to dim.
Therefore, LEDs at the end of a strip will always get less voltage than the ones at the beginning. If you make the strip long enough, the voltage drop will become significant enough to cause a visible difference in brightness.

How does higher voltage reduce the effects of voltage drop?

First, you have to understand how all the components on an LED strip are connected.

Most individual LED chips run on 3V DC power regardless of whether they are mounted on a 12V strip or a 24V strip. In fact, the same LED chip that works on a 12V strip could also be mounted on a 24V strip. What makes the difference is how the strip circuitry is designed.

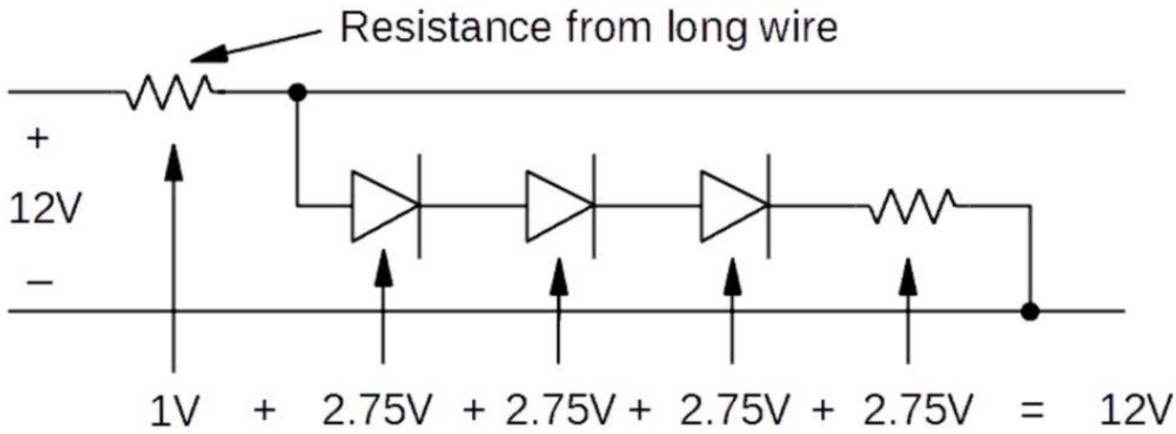
LED chips are wired in series into groups. Each group contains some LED chips and a resistor. The total voltage drop across the group has to be equal to the total voltage of the strip (see diagrams below).



Then, each group is wired in parallel and arranged along the length of the strip.

For now, take notice (above diagrams) that the group size on a 24V strip is 7 LEDs compared to only 3 LEDs for 12V. I will explain why this is significant below.

Every wire has a certain amount of resistance to electricity being pushed through it. The longer the wire gets, the bigger the resistance (and the voltage drop) gets. Eventually, it gets large enough to impact the LED brightness. Below is an example of how it might happen on a 12V strip.

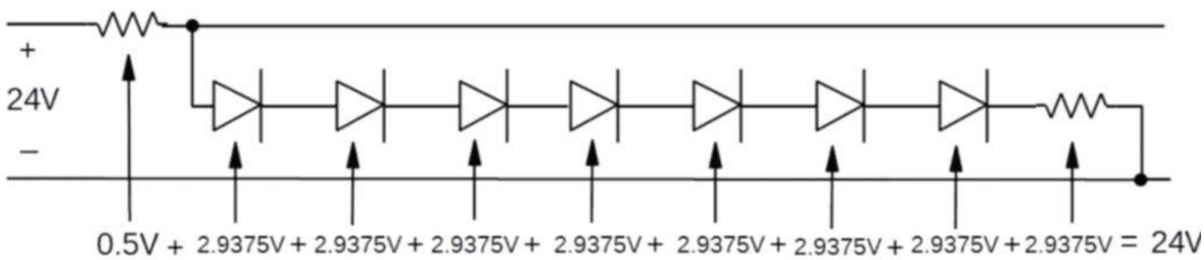


Notice in the above diagram that the voltage across the LEDs has dropped from 3.0V to 2.75V.

When we switch to 24V, two things happen that reduce the voltage drop.

When the voltage gets doubled (12V to 24V), the current is halved (Ohm’s law P=U * I). That causes the voltage drop from the long wire to be reduced by half as well. So instead of a 1V drop, it becomes 0.5V drop.

The effect of the 0.5V drop is split between the eight remaining circuit components (compared to 4 on the 12V).



Notice here that the voltage across the LEDs has only dropped to 2.9375V compared to 2.75V with the 12V strip.
If you have an application that requires long runs of strips, it may be a good idea to use 24V strips. But, even 24V strips have a limit. You may have

to use other techniques to stop your LEDs from fading at the end. For example, use our Super Long Constant Current LED Strips.

24V LED strip can be higher efficiency

Higher voltage can be more efficient.

Any time there is the voltage across a resistor, it means energy is getting converted to heat instead of light. Therefore, the resistors in the above diagrams are necessary, but they' re also a source of wasted energy.

Total voltage of strip	Voltage across resistor	% Power "wasted" on resistors
5V (1 LED Per Group)	2V	40%
12V (3 LEDs Per Group)	3V	25%
24V (7 LEDs Per Group)	3V	12.5%

It' s easy to see that higher voltage strips suffer from less wasted energy. LEDs use such a small amount of energy that this doesn' t add up to much for small installations. But, the difference in power usage can become significant for the whole room or commercial installations.

We have developed high-efficiency LED strips, 8 LEDs per cut, up to 190LM/w.

This is the same principle as high-voltage power transmission. The higher the voltage, the smaller the current. According to Ohm' s law, the voltage drop Vdrop=I * R, the electrical energy converted to heat P=U * I = (I * R) * I = I 2 * R.

24V LED strip requires less conductor gauge

Electrical power is determined by the equation P = V * I. To maintain the same power (P), if voltage (V) goes up, current (I) must come down by a proportional amount.

If we keep 48W as our target output as a concrete example, a 12V system will require 4 Amps (12V x 4A = 48W), while a 24V system will only require 2 Amps (24V x 2A = 48W).

Simply put, a 24V LED system will draw half the amount of current as a 12V LED system to achieve the same power level.

Why is this important?

Total current, rather than voltage, determines the thickness and width of copper conductors needed to transfer power safely.

If excessive amounts of current are forced through a small or narrow copper conductor, resistance inside the conductor will become significant and contribute to voltage drop and heat generation. In very extreme cases, this can even lead to electrical fires.

All else equal, a 24V LED system can get away with half of the electrical conductor requirements. You can use the voltage drop calculator to ensure you are still using sufficient conductor gauges for your LED strip projects.

Smaller power supplies for 24V LED strip

Like conductor size, power supply size is also determined primarily by current rather than voltage. Part of this is also influenced by the physics relationship between electrical current and conductor size needs, as much of a power supply unit's internal wiring comprises copper wiring.

Power supply size can be important when working with projects such as LED strip lights in under cabinet installations where there may be space constraints.

How to Choose The Right Adhesive Tapes For LED Strip

LED strips are becoming more and more popular, and many lighting designers like to use LED strips for linear lighting projects. Most LED strips are ve

ry easy to install. You just need to tear off the double-sided tape attached to the back of the LED strip and stick it where you want. Double-sided tape is a very critical component. If the quality of the double-sided tape is not good, the LED strip will fall off from where it is installed.

LEDYi will provide different solutions of double-sided tape according to the different scenarios of LED strips. We mainly offer the following double-sided adhesive tapes.

- 3M 200MP
- 3M 300MP
- 3M 9080
- 3M VHB 5608N
- tesa 4965
- Blue Thermal Tape

Adhesive Tape	Usage Scenarios	Adhesive Thickness mils(mm)	Adhension to Stainless Steel
3M 200MP	Normal Indoor Use	5.2mils(0.13mm)	7.0N/CM
3M 300MP	Normal Indoor Use	4.8mils(0.12mm)	8.6N/CM
3M 9080	Normal Indoor Use	12.8mils(0.32mm)	7.5N/CM
3M VHB 5608N	Indoor or Outdoor Use	30.4mils(0.76mm)	20.0N/CM
tesa 4965	For Aluminum Profile	8.2mils(0.205mm)	14.0N/CM
Blue Thermal Tape	For High Power Strip	4.0mils(0.1mm)	6.0N/CM

3M 200MP

3M™ Adhesive 200MP is a popular choice for graphic attachment and membrane switch applications because it has excellent quality, consistency and durability. In addition, as a result of 3M's innovative, proprietary process, 3

M adhesive 200MP also offers the following excellent performance characteristics.

Clarity (virtually free of vapor inclusions that are commonly found in adhesives produced by the traditional solvent coating technique).

Excellent high temperature performance as well as excellent shear strength (that minimizes edge lifting and slippage of parts).

Excellent resistance to harsh environments; this adhesive can withstand splashes of organic solvents, weak acids and bases and salt water, cleaning solutions, germicidals, disinfectants, oils, etc. In addition, it performs well after exposure to humidity and hot/cold cycles.

Provides some initial repositionability when bonding to plastic parts (not metal) which allows graphic parts to be lifted and repositioned if initial alignment is incorrect.

Finally, this adhesive family is provided with a variety of liner configurations to help ensure excellent process flexibility.

More information, you can visit https://multimedia.3m.com/mws/media/7986750/3mtm-laminating-adhesive-200mp-brochure-in-high-resolution.pdf



3M 300MP

3M™ Double Coated Tapes with 3M™ Adhesive 300MP provide high adhesion to a wide variety of materials, including plastics and foams and has a thin nonwoven carrier for dimensional stability and improved handling.

- Excellent adhesion to open cell foams.
- Consistent adhesive performance to many plastics.
- Polycoated liner for ease of handling.

More information, you can visit https://multimedia.3m.com/mws/media/16214100/3m-300mp-acrylic-adhesive-brochure.pdf



3M 9080

3M™ Double Coated Tape 9080HL is a Double Coated Non-woven Tape with Polycoated Paper Liner. High tack adhesive suitable for high temperature and bonding to LSE materials.

3M™ Double Coated Tape 9080HL is specially formulated for low- and high-speed splicing applications, followed if required by heat-setting or other oven-based processing conditions. The tape makes an excellent bond to paper and board, and many plastic film substrates including Polyethylene, Polypropylene and PVC.

- General purpose, double sided tissue tape
- High tack, high initial adhesion
- Pressure sensitive adhesive
- Easy to remove liner
- Economy tape

More information, you can visit https://www.3m.com/3M/en_LB/p/d/v000143146/

3M VHB 5608N

3M™ 5608 Acrylic Foam Tape is a high performance tape made of grey acrylic foam. The tape is especially qualified for attaching elastomeric parts such as seals to car bodies and doors. 5608 is characterised by its high adhesion to a variety of automobile surfaces. One side of the tape is attached to the painted surface or the respective substrate by a pressure sensitive adhesive. The other side is bonded to the elastomeric part through heat-activation.
The heat-activated adhesive guarantees a durable bond, especially to seals made of EPDM and TPE Rubber.
A good inner strength, brilliant long-term stability as well as very good conformability to the bonded surfaces are characteristic attributes of 5608.

More information, you can visit https://multimedia.3m.com/mws/media/9991900/3m-automotive-heat-activatable-acrylic-foam-tape-5608.pdf



tesa 4965

tesa® 4965 Original is a transparent, double-sided self-adhesive tape consisting of a PET backing and a tackified acrylic adhesive. Its adhesive technology is based on a patented and protected product formulation. Several products are equipped with this unique and high performing product design and together these products make up Team 4965.
This double-sided film tape assortment helps to easily select the most efficient tape based on customer demands, products, and processes.

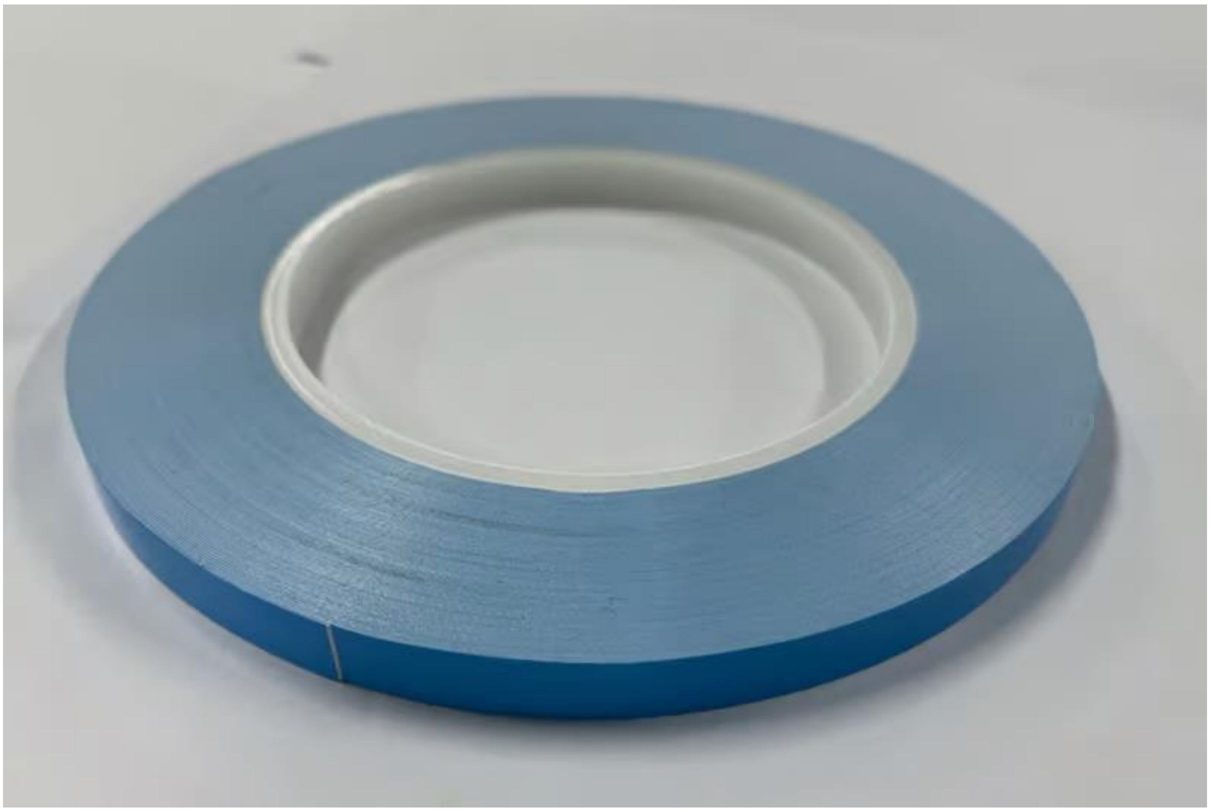
More information, you can visit https://www.tesa.com/en/industry/tesa-4965.html



Blue Thermal Tape

Blue Thermal Tape is designed to provide a preferential heat-transfer path between heat generating components and heat sinks or other cooling devices (e.g., fans, heat spreaders or heat pipes).

It is generally attached to a high-power LED strip, and then the LED strip is attached to the aluminum profile. In this way, the heat of the LED strip can be quickly transferred to the aluminum profile so that the LED strip can be kept at a suitable working temperature.



How to Dim LED Strip Lights

Dimming is the process of varying the light output of a light source. This is done to set the ambience or to save energy when full light output is not really needed. Most of the dimming systems used before LEDs or even today are designed for incandescent light bulbs. These systems usually use forward-phase and reverse-phase dimming methods in which the dimmer interrupts or chops the AC line input to reduce the power going into the driver. With less input power, there will be less output on the driver, and the brightness of the light is decreased.

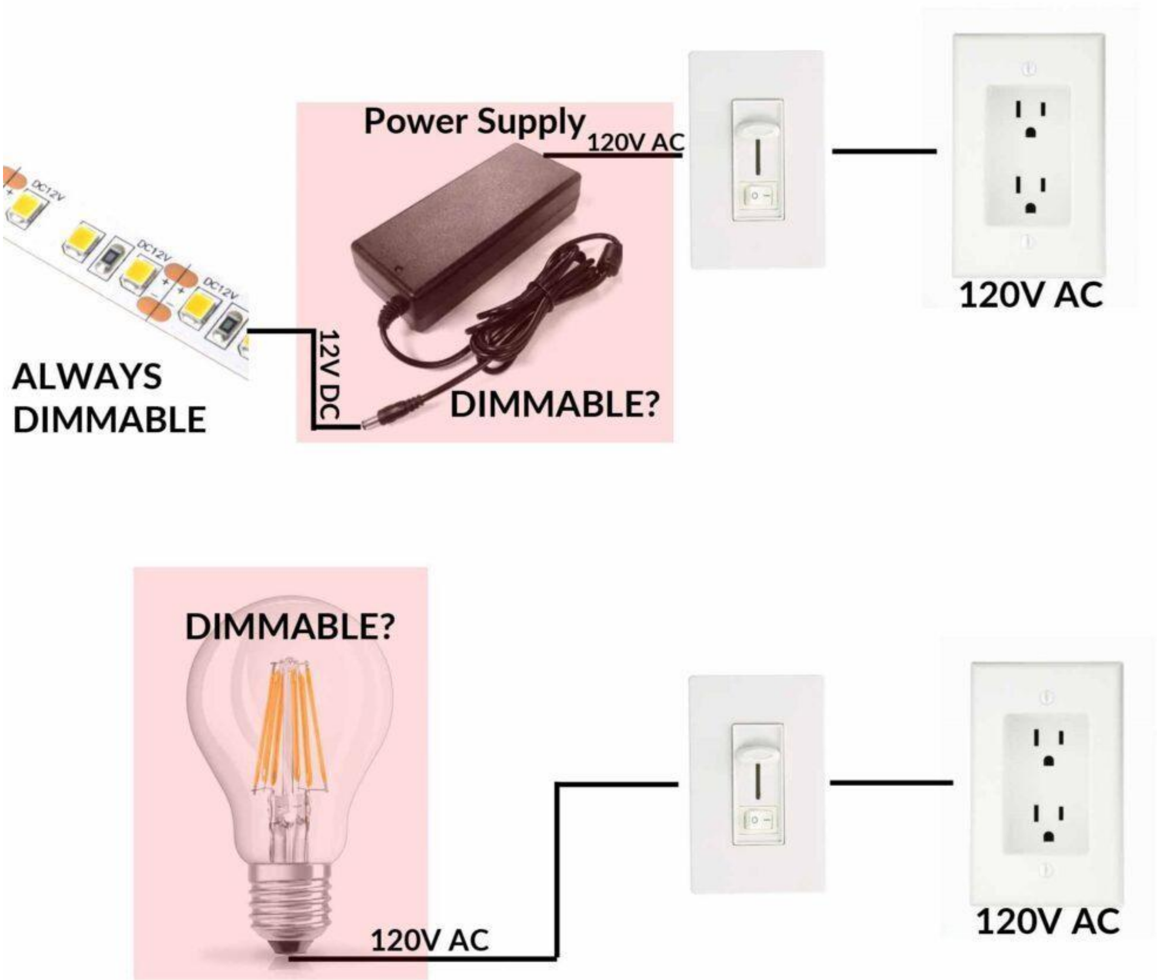
The most commonly heard dimming keywords in LED commercial lighting are DMX, DALI, 0/1-10V, thyristor (TRIAC), WIFI, Bluetooth, RF, and Zigbee. These are the input signals of the dimming power supply. The selection of different input signals is mainly due to the consideration of the environment (installation, wiring), function, cost, and flexibility of later expansion. The quality of the dimming effect is mainly determined by the output dimming method of the dimming power supply, not the input dimming method.

The output dimming methods of dimming power supply are mainly divided into two types, Constant Current Reduction (CCR) and Pulse Width Modulation (PWM) (also known as Analog Dimming).



First, a clarification: actually, all LED strips are dimmable.

When you shop for common household LED lights like A-style bulbs, you may often see NOT DIMMABLE listed under the product description. Some LED bulbs are not dimmable because the electrical circuitry inside the LED bulb is not designed to interpret the dimming signal of a wall dimmer, which, in turn, is/was intended for a traditional incandescent bulb.



On the other hand, LED strips are not designed to be connected directly to high voltage (e.g. a 120V AC wall socket), and require a power supply to convert the higher voltage AC into a lower 12V or 24V DC voltage.

Therefore, if a wall dimmer is involved, it must first “talk” to the power supply before any dimming can happen at the LED strip. Therefore, the dimmable/not dimmable question depends on the power supply unit, and whether it can interpret the dimming signal produced by the wall-dimmer.

On the other hand, virtually all LED strips (as in, the strip itself) are dimmable. Given the appropriate DC electrical signal (typically PWM), any LED strip’s brightness can be freely adjusted.

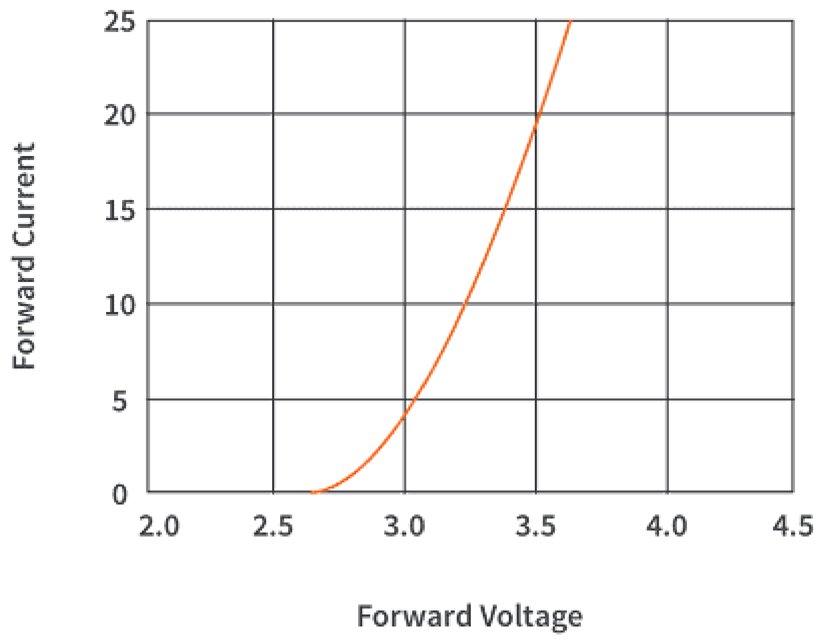


Please note that there are generally two types of led strips on the market, constant current and constant voltage. Their requirements for dimming power supply are different. Please refer to the table below:

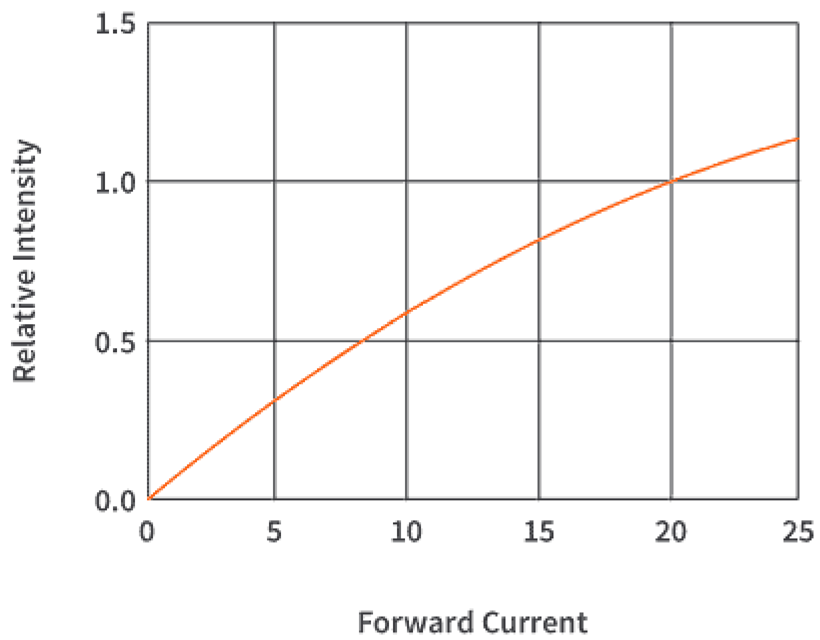
LED Strip Type	Constant Current Reduction (CCR)	Pulse Width Modulation (PWM)
Constant Voltage LED Strip	Work	Work
Constant Current LED Strip	Fail	Work

What controls the brightness of an LED?

The amount of current flowing through an LED determines its light output. If we look at the graph above, we will see that changing the voltage also changes the current through the LED, making us think of dimming an LED by increasing or decreasing the voltage across it. However, we can also see that the region where we can change the voltage without getting too much current is tiny. Also, the current is not predictable as well, as the brightness.



Forward Current (mA) vs. Forward Voltage (V) Graph of an LED



Relative Intensity (a.u.) vs. Forward Current (mA) Graph of an LED

If we scan some LED datasheets, we can see that the luminous intensity of an LED depends on the forward current. Their relationship is almost linear too. So in dimming LEDs, we take the forward voltage as a fixed value and control the current instead.

LED Dimming Methods

All LED devices require a driver to be dimmed, and there are two standard methods that drivers use to dim LEDs: Pulse Width Modulation and Constant Current Reduction (also known as Analog Dimming).

Pulse Width Modulation (PWM)

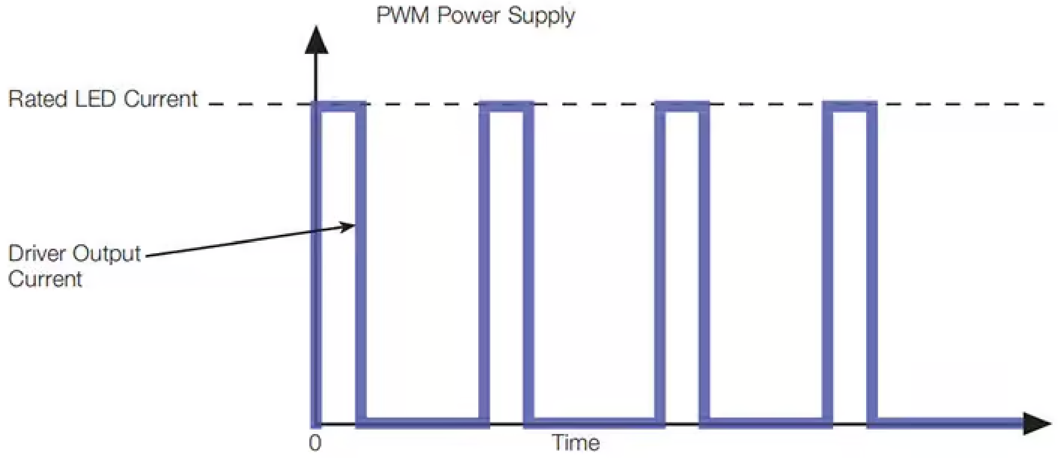
In PWM, the LED is turned ON and OFF at its rated current at a high frequency. The rapid switching is high enough for the human eye to see. What determines the brightness level of the LED is the duty cycle or the ratio of the time when the LED is ON and the total time of one complete cycle.

Advantages:

- Provides a very precise output level
- Suitable for applications that need to maintain certain characteristics of the LED such as color, temperature, or efficiency
- Broad dimming range - can decrease light output to values of less than 1 percent
- Avoids color shift by operating the LED at its recommended forward voltage/forward current operating point

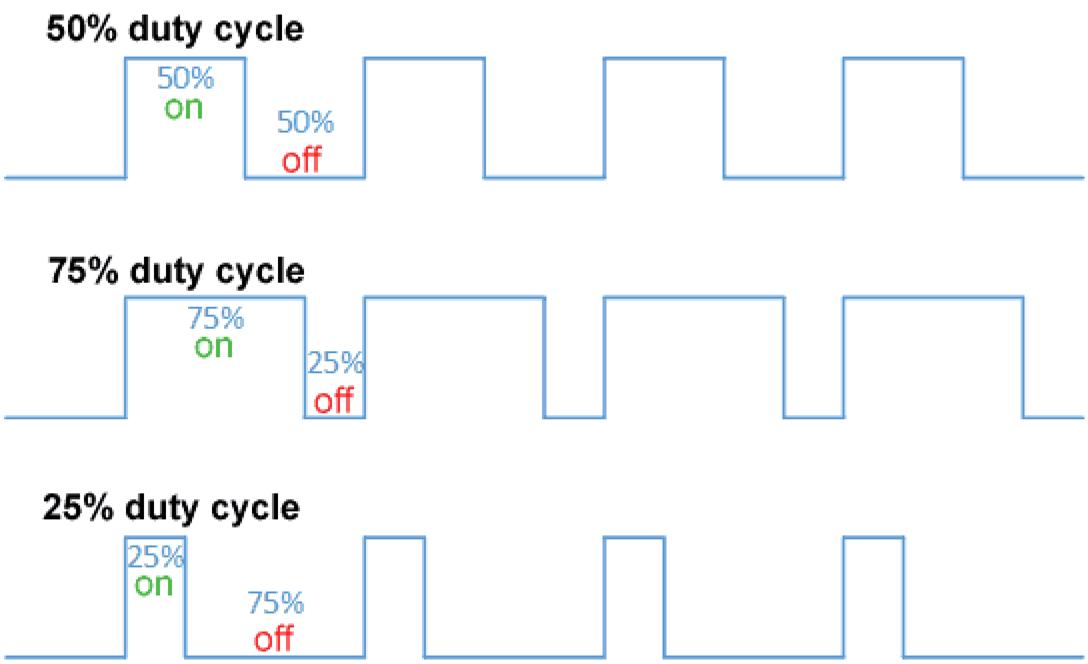
Disadvantages:

- Drivers are complex and expensive
- Since PWM uses fast switching, the fast-rising edge and falling edge of each switching cycle produce unwanted EMI radiations
- The driver might have performance issues when running with long wires since the stray characteristics of the wire (capacitance and inductance) can interfere with the fast edges of the PWM



Duty Cycle

The term duty cycle describes the proportion of 'on' time to the regular interval or 'period' of time; a low duty cycle corresponds to low power, because the power is off for most of the time. Duty cycle is expressed in percent, 100% being fully on. When a digital signal is on half of the time and off the other half of the time, the digital signal has a duty cycle of 50% and resembles a "square" wave. When a digital signal spends more time in the on state than the off state, it has a duty cycle of >50%. When a digital signal spends more time in the off state than the on state, it has a duty cycle of <50%. Here is a pictorial that illustrates these three scenarios:



Frequency

Another integral aspect of the pulse width modulation(PWM) signal is its frequency. The PWM frequency stipulates how fast the PWM signal completes a period, where the period is the time taken for the signal to go on and off.

$$\text{Frequency} = \frac{1}{\textbf{\textit{Time period}}} \text{ where,}$$

$$\text{Time period} = \text{on time} + \text{off time}$$

Reconciling the duty cycle and frequency of the PWM signal creates the possibility of a dimmable LED driver.

Constant Current Reduction (CCR)

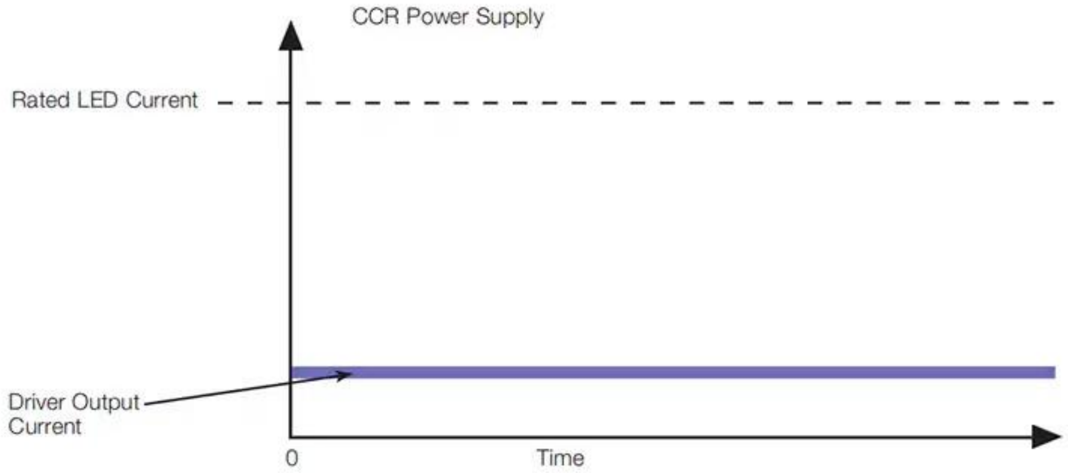
In CCR, the current flows continuously through the LED. So the LED is always ON, not like in PWM where the LED is always turned ON and OFF. The brightness of the LED is then varied by changing the current level.

Advantages:

- Can be used with applications with strict EMI requirements and remote applications where long wire runs are used
- CCR drivers have higher output voltage limit (60 V) than drivers that use PWM (24.8 V) when classified as UL Class 2 drivers for dry and damp locations

Disadvantages:

- CCR is not suitable for applications where dimming light levels below 10 percent is desired because at very low currents, LEDs do not perform well and the light output can be erratic
- Low drive currents can result into inconsistent color



DMX512 Dimming

DMX512 is a standard for digital communication networks that are commonly used to control lighting and effects. It was originally intended as a standardized method for controlling stage lighting dimmers, which, prior to DMX512, had employed various incompatible proprietary protocols. It quickly became the primary method for linking controllers (such as a lighting console) to dimmers and special effects devices such as fog machines and intelligent lights.

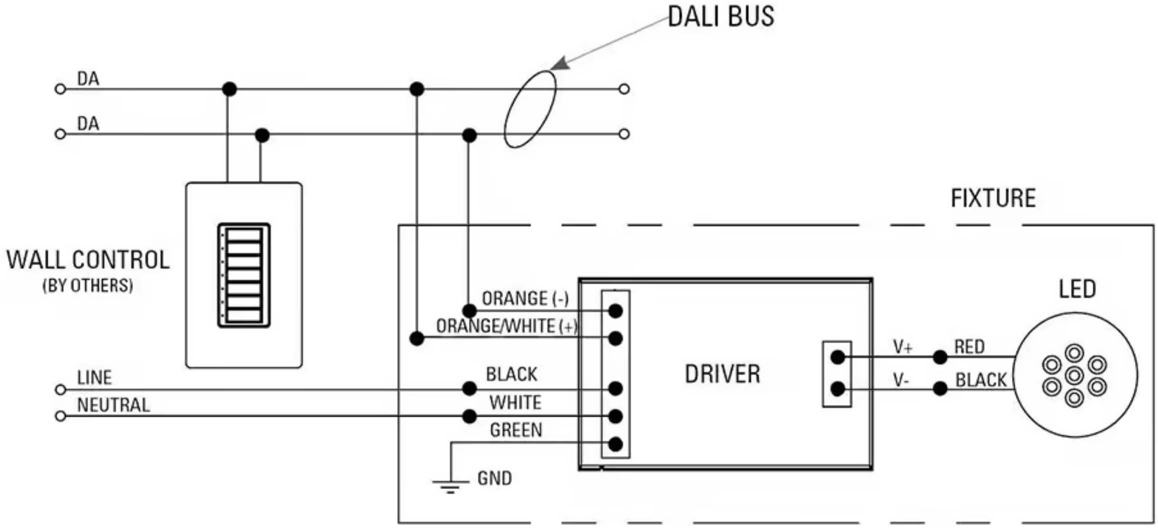
DMX512 has also expanded to uses in non-theatrical interior and architectural lighting, at scales ranging from strings of Christmas lights to electronic billboards and stadium or arena concerts. It can now be used to control almost anything, reflecting its popularity in all types of venues.



DALI Dimming

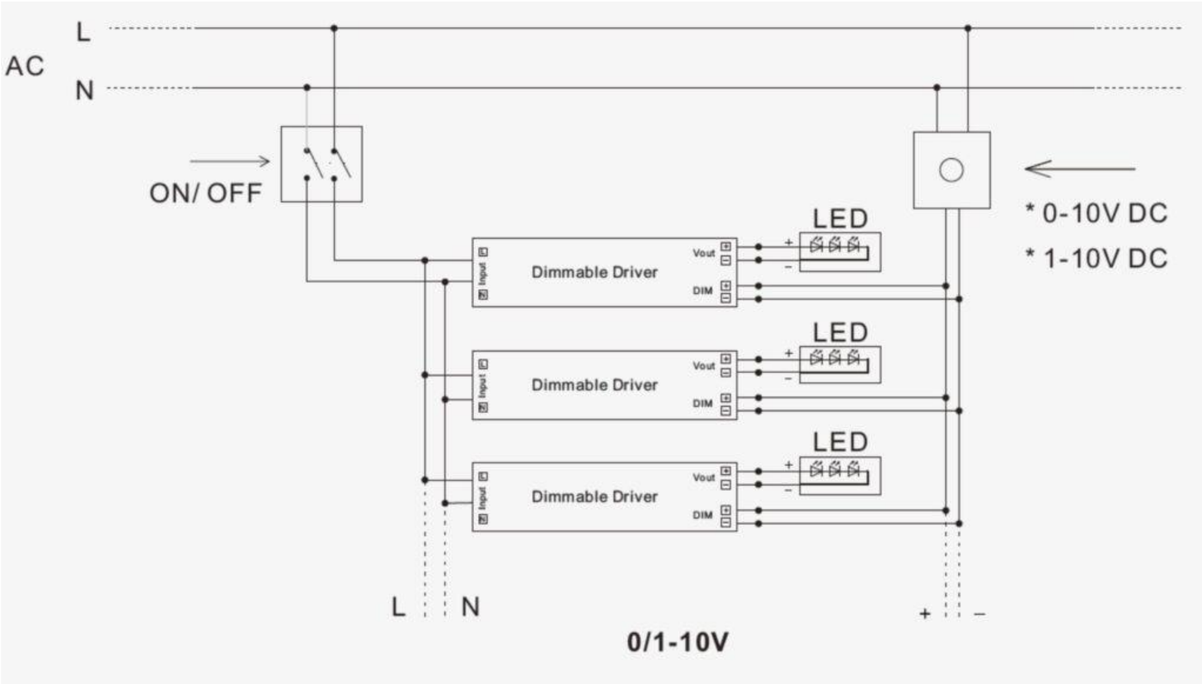
The Digitally Addressable Lighting Interface (DALI) originated in Europe and has been heavily implemented for many years in that part of the world. It is now becoming more popular in the United States as well. The DALI standar

d allows for digital control of individual fixtures via a low voltage communication protocol that can send information to light fixtures while also receiving data from the fixtures, making this a valuable tool for building information monitoring systems and controls integration. DALI allows for addressing individual fixtures, with up to 64 addresses possibly organized into 16 different control zones. DALI communication is not polarity sensitive, and a variety of connection configurations are possible with this protocol.
A typical DALI wiring diagram is shown below:



0/1-10V Dimming

The first and simplest electronic lighting control signaling system, low voltage 0-10V dimmers, use a low voltage 0-10V DC signal connected to each LED power supply or Fluorescent ballast. At 0 Volts, the device will dim to the minimum light level allowed by the dimming driver, and at 10 Volts the device will be operating at 100%. A typical 0-10V wiring diagram is shown below:



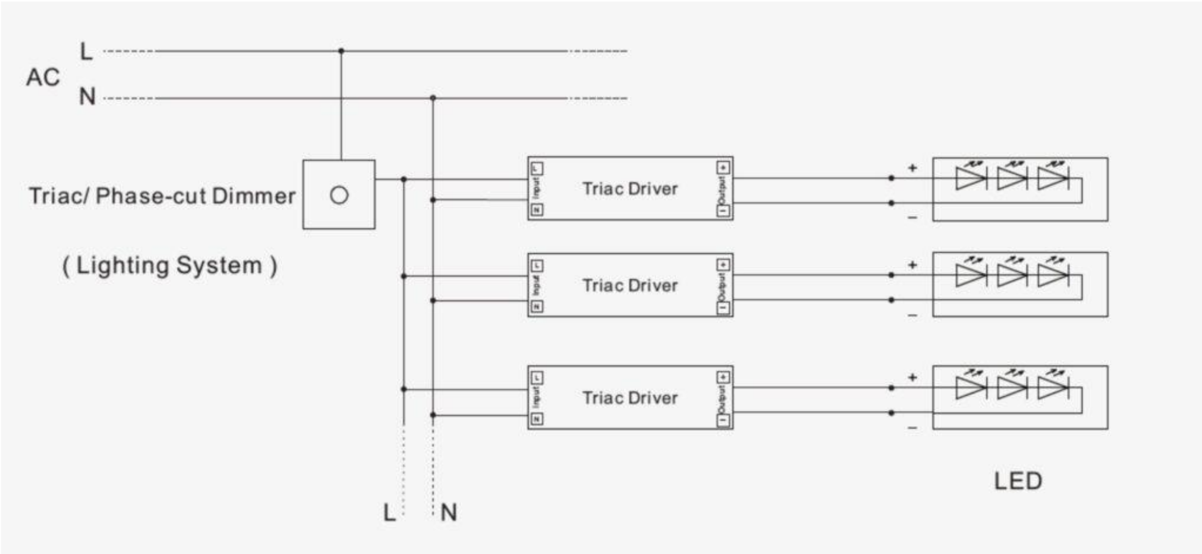
TRIAC Dimming

TRIAC stands for Triode for Alternating Current, and is a switch that is used to control power. When used in lighting applications, it’ s commonly referred to as ‘TRIAC dimming’ .

TRIAC circuits are widely used and very common in AC power control applications. These circuits can switch high voltages and very high levels of current in the two parts of an AC waveform. They are semiconductor devices, similar to a diode.
TRIAC is often used as a means of light dimming in domestic lighting applications and can even serve as a power control in motors.

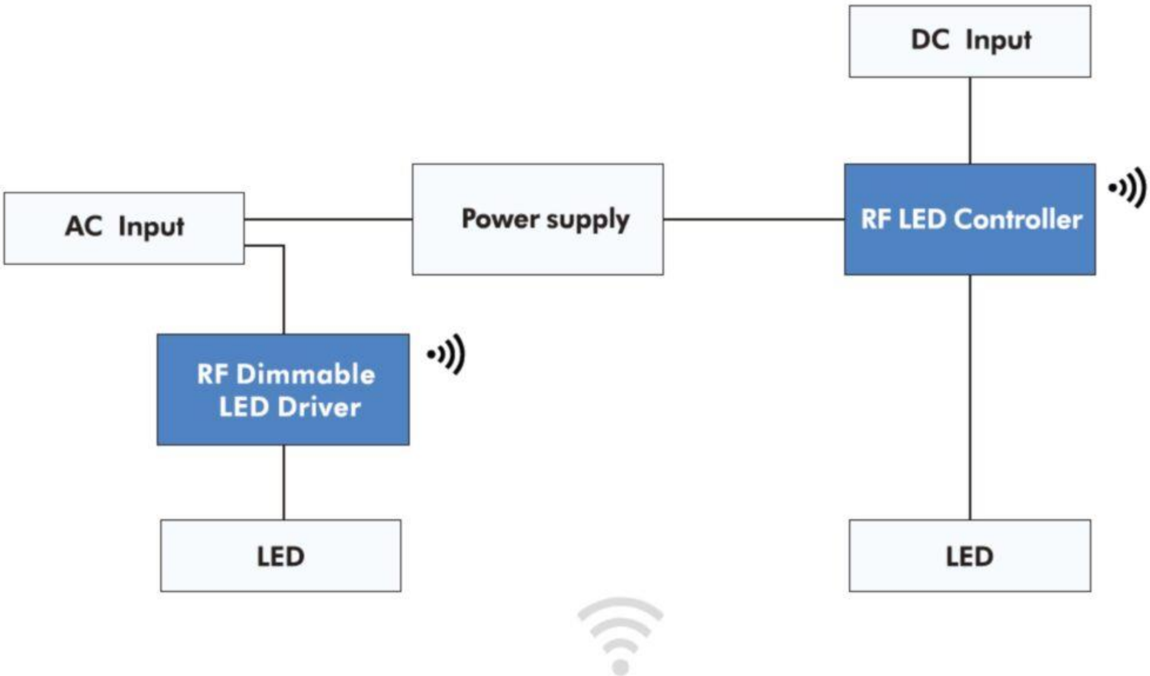
TRIAC’ s ability to switch high voltages makes it ideal for use in diverse electrical control applications. This means it can work to suit everyday lighting-control needs. TRIAC circuits are used for more than just domestic lighting, though. They are also utilized when controlling fans and small motors and in other AC switching and control applications.
If you are looking for a multipurpose control, we are sure you will find TRIAC a beneficial protocol.

TRIAC is high voltage (~230v) dimming. Wiring a TRIAC module to your mains supply (between 100-240v AC), you will be able to get the dimming effect you require.

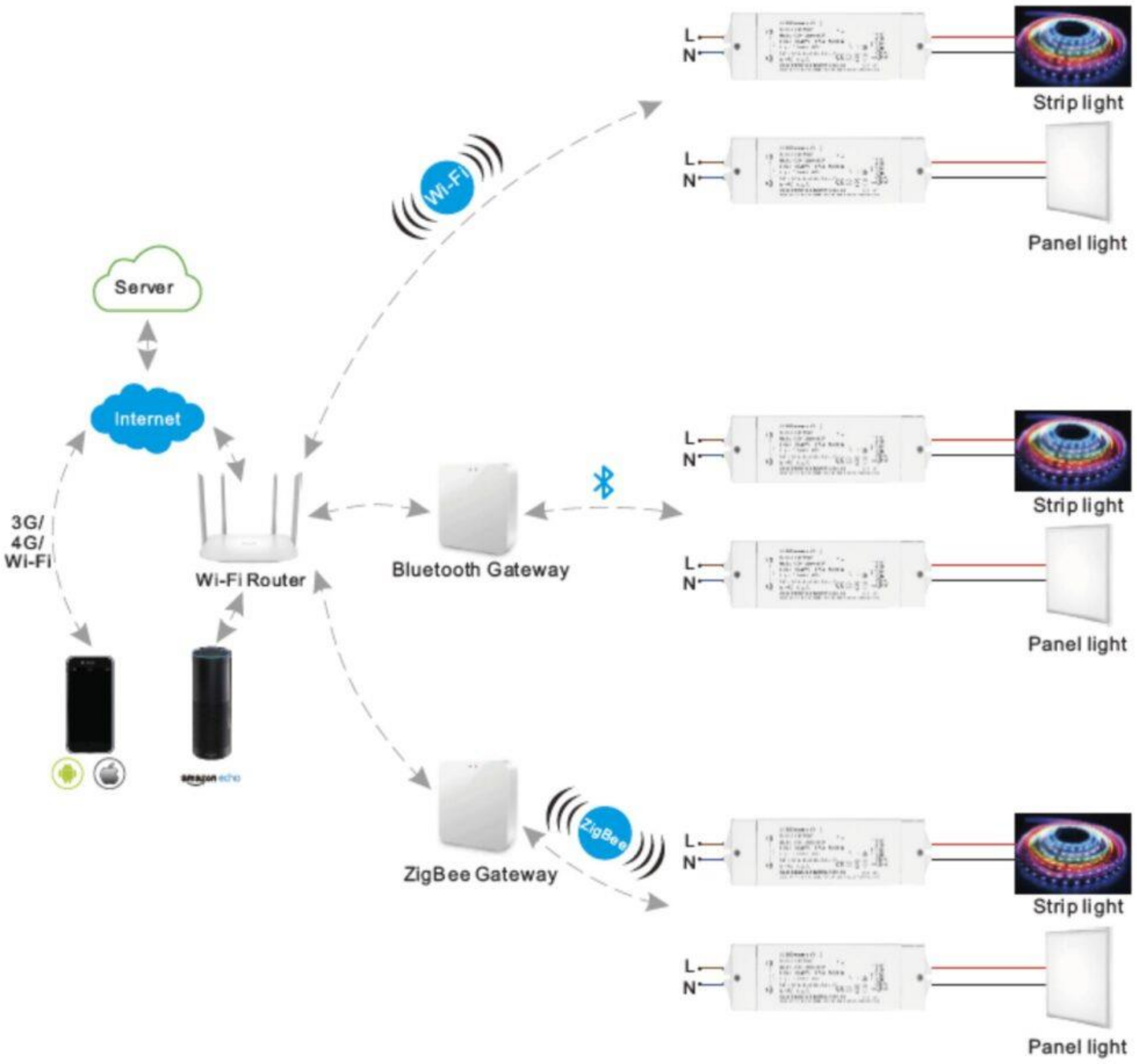


RF Dimming

Radio frequency (RF) dimming use a radio frequency signal to communicate with the LED controller to dim the color of your LED lights.



Bluetooth, WIFI, Zigbee Dimming



Bluetooth is a short-range wireless technology standard that is used for exchanging data between fixed and mobile devices over short distances using UHF radio waves in the ISM bands, from 2.402 GHz to 2.48 GHz, and building personal area networks (PANs). It is mainly used as an alternative to wire connections, to exchange files between nearby portable devices and connect cell phones and music players with wireless headphones. In the most widely used mode, transmission power is limited to 2.5 milliwatts, giving it a very short range of up to 10 metres (33 ft).

Wi-Fi or WiFi (/ˈwaɪfaɪ/), is a family of wireless network protocols, based on the IEEE 802.11 family of standards, which are commonly used for local area networking of devices and Internet access, allowing nearby digital devices to exchange data by radio waves. These are the most widely used computer networks in the world, used globally in home and small office networks to link desktop and laptop computers, tablet computers, smartphones, smart TVs, printers, and smart speakers together and to a wireless router to connect them to the Internet, and in wireless access points in public places like coffee shops, hotels, libraries and airports to provide the public Internet access for mobile devices.

Zigbee is an IEEE 802.15.4-based specification for a suite of high-level communication protocols used to create personal area networks with small, low-power digital radios, such as for home automation, medical device data collection, and other low-power low-bandwidth needs, designed for small scale projects which need wireless connection. Hence, Zigbee is a low-power, low data rate, and close proximity (i.e., personal area) wireless ad hoc network.

Tunable White LED Strip: The Complete Guide

When it comes to ambient lighting, preference differs from person to person. Some love warm-tone, cozy light settings, while others want cool-tone white lights. But won’t it be superb having both lighting vibes in a single system? Tunable white LED strips will get you this excellent light color adjusting facility.

Tunable white LED strips are color temperature-adjustable LED strips. It can create a variety of white light hues ranging from warm to cooler tones. Using the controller that comes with the fixture, you can easily change the color of the lights to suit your needs or your mood. Besides, they are energy efficient and easy to maintain. So, you can use them in the bedroom, kitchen, bathroom, office, and many more places.

This article will provide a comprehensive overview of the Tunable White LED strip. Including information on how to buy, install, and use it. So let’s keep reading!

What is a Tunable White LED strip?

Tunable white LED strips are referred to the LED strips with adjustable color temperature (CCT). In these strips, you can get a wide range of white lighting. These are typically 24V adjustable LED strips. And using a DMX controller, a wired or wireless remote control, or both, you may change the color temperature.

The Tunable LED strips are excellent for modifying the white color temperature to meet different lighting needs. For example, a higher color temperature of white lighting, such as 6500K, is great for a bedroom for daytime activity. And at night, you can go for a warm tone around 2700K, making it easier to relax and fall asleep.

How Does Tunable LED Strip Change The CCT?

CCT refers to Correlated Color Temperature. It is the most crucial factor to consider for understanding the color-changing mechanism of tunable white LED strips. The shades of light change with varying CCT ratings. For instance, lower CCT gives warm whites; the higher the ratings, the cooler the tone.

Tunable white LED strips regulate the temperature of the white color to change the warm and cool tones of white. However, creating Tunable White LED lighting requires a lot of work and is highly complex. Numerous LED outputs must be combined to achieve the results needed with tunable white LED lighting. A decent tunable will create temperatures at various Kelvins and have many white light outputs.

There are tow CCT LEDs on the tunable white LED strip. The controller can obtain various color temperatures by controlling the brightness of this two CCT LEDs.

Here, the blending process is vital to achieving the desired CCT. To achieve the required CCT, use the remote to control the blending procedure directly. The previous Tunable White LED strips need some time to warm up and alter the temperature. Due to the remote control included with the lighting system, the current system is quick. And you can control anything in real time by simply pressing the desired button.



Color Temperature For Tunable White LED Strip

The lighting of tunable white LED strips varies with the changing color tem perature. The color temperature is measured in Kelvin (K). And for differen t temperatures, the output of light color also changes.

Usually, the CCT for Tunable White LED ranges from 1800K to 6500K or 2700K to 6500K. And within these ranges, you will get any shade of white light fr om warm to cool tones. Check the below table to get an idea about different shades of white lights in correspondence to color temperature-

Lighting Effect For Different CCT Ratings

CCT (1800K-6500K)	Tones Of White
1800K-2700K	Ultra Warm White
2700K-3200K	Warm White

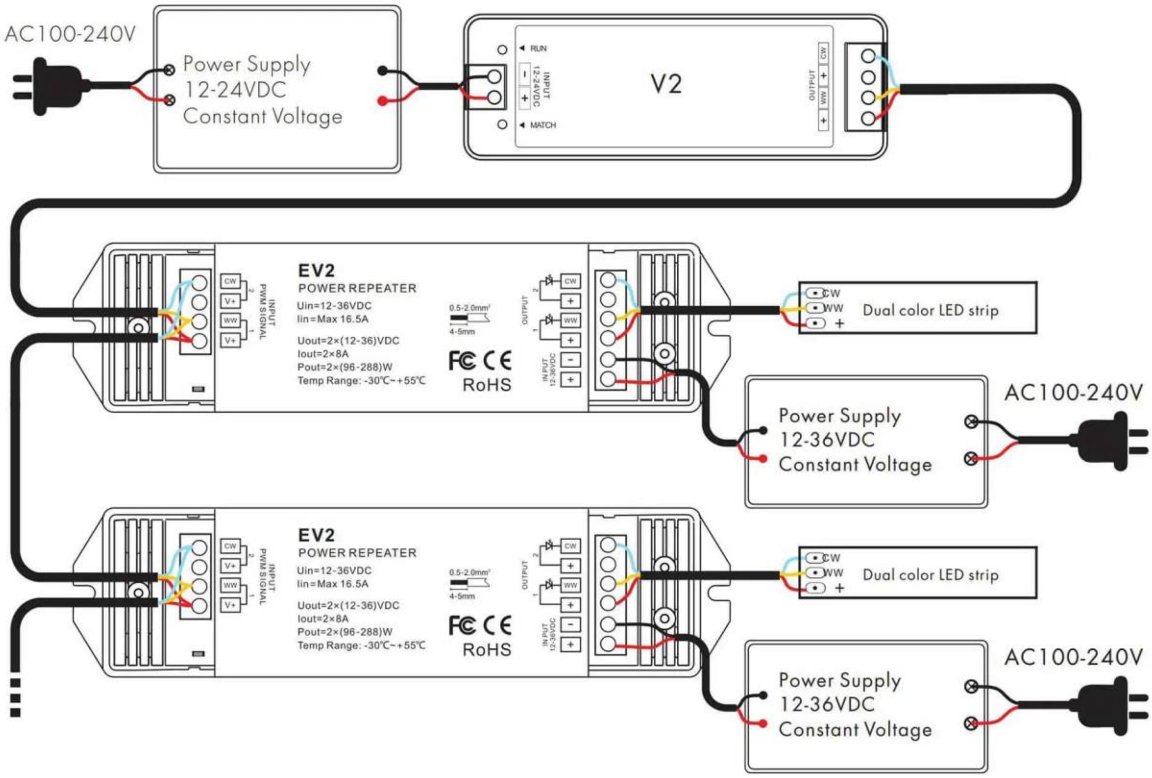
3200K-4000K	Neutral White
4000K-6500K	Cool White

How To Control Tunable White LED Strips?

A remote is required to control the tunable white LED strips. It offers multiple options, including changing the color temperature, or brightness. You can obtain the desired outcome by installing these lights into the building’s control structure. You can also adjust them to match the mood of the people using the space. The controlling system you can go for tunable white LED strips are:

1. RF Controller
2. RF Remote
3. Power Repeater/ Amplifier
4. DMX512 & RDM Decoder

Therefore, to change the setting to your desired color temperature, you can use any of these LED controllers compatible with your tunable white LED strips. You may change the Kelvin range to anywhere between 1800K and 6500K, enough to produce the ambiance you want.



Tunable White Controller Connection With Amplifier Diagram

Benefits Of Tunable White LED Strip Lights

Tunable white LED strips are excellent for interior lighting. Below are some features or benefits of tunable white lights-

Better Mood Setting

The fun fact is that lights impact the human non-visual sense. You feel energetic when the color is blue or cool, while a warm white tone relaxes you. Research indicates that lighting can change your diet. It shows how light affects our ability to adjust how much we eat, how quickly we eat, how less we eat, and all other aspects of our eating habits.

Purchasing tunable white LED strips is worth it since the light’s color can be changed to suit your mood, ranging from very warm to white light. You can use them in your bedroom, living room, bathroom, kitchen, etc.

Higher Productivity

Numerous studies have shown that bright lighting helps you concentrate, improving work efficiency. The same is true when warm light is present in your environment; you become less concentrated and more relaxed.

Additionally, a mild red tone improves your health and enables you to operate more effectively in teams and on creative projects. Other studies recommend the high-tone color settings for morning and afternoon work hours. These will help people concentrate more.

The lighting CCT or brightness level decreases as the day or night goes on. These are the best times to relax and feel at peace because melatonin will start to be created promptly. It is also recommended to use tunable white LED strips to change the color temperature in meeting rooms. Because it improves attention spans and brain-storming sessions.

Let's talk about how different color temperatures can fit different environments.

- 2000K and 3000K, if you prefer a warm, cozy setting. Preferable for bedrooms or dining rooms, as these are the locations you want to feel the most at ease and ease with yourself.

- If you want a formal look, such as in your office, the color temperature should be between 3000K and 4000K. Offices and kitchens benefit most from the cool white light because these areas require the focus most.

- Between 4000K and 5000K is the ideal color temperature for kids to take into account for school. This environment should be cheerful and enjoyable, so students are eager to learn there.

For more information, you can read Best Color Temperature for LED Office Lighting.

Better Health

Many studies show the benefits of having a proper color temperature for human health. It improves your sleep, makes you happier, keeps your job efficiency on track, and even affects how well you study.

For more information, you can read [What Color LED Light Is Best For Study, Sleep, & Game?]

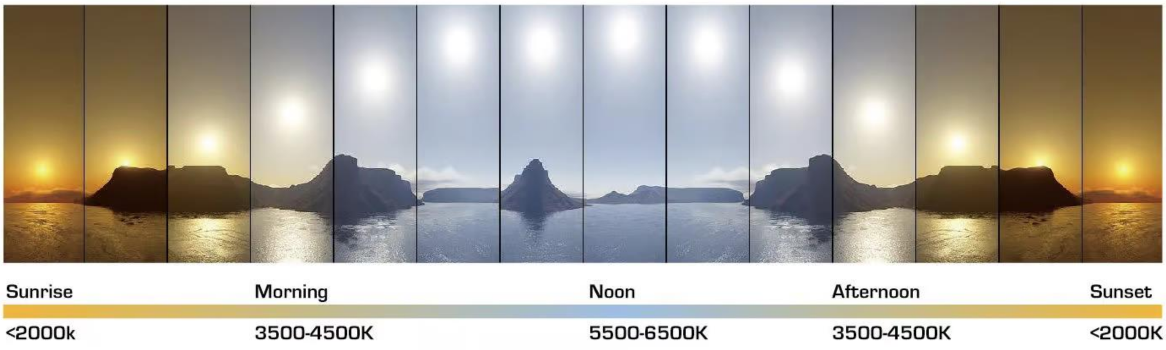
Perfect For Your Circadian Rhythm

Humans have developed a biological cycle known as circadian rhythms, which has evolved over a while under the sun as a daily cycle. Its purpose is to raise the body's temperature and create a variety of hormones and alertness levels.

The internal clock regulates the circadian rhythm and plays a vital role. It is used to continuously change the levels of all these substances during the day, which runs for about 24 hours. When hormone synthesis needs to be started or stopped, it resets and then continues using some form of external information, such as light. Tunable LED lights are excellent in this situation. They support your circadian cycle by providing work lighting ideal for sleep. And while working, you can switch to cool lighting. .

Cost-effective

Electric lighting made life easier for people because you could complete tasks without waiting for the sun to rise the next day. Depending on your mode, a tunable white LED strip will give you the impression of a warmer or cooler tone. Additionally, it has a nice appearance and is among the most cost-effective lighting systems with the highest quality. This technology utilizes less energy than incandescent lights, lowering your electricity costs. In a single lighting system, you receive both yellow and white lights.



Applications of Tunable White LED Strip Lights

Tunable white LEDs are excellent for a wide range of uses. Among these, the most common usage of tunable white LED strips is as follows-

Residential Lighting

Tunable LED strips are excellent for residential lighting. You can use them in different places like your bedroom, bathroom, living area, etc. They also provide an additional advantage to different moods. For instance, you can choose a warm tone for your bedroom at night for a cozy vibe. Again during working hours, go for a cool white tone that will give you an energetic mood.

Ambient Lighting

You can use tunable white LED strips as ambient lighting for your home, office, and commercial areas. And using these strips will help you experiment with the general light setting of your space.

Commercial Space Lighting

When choosing lights for commercial areas, tunable white LED strips are excellent. You can change the outlook of your showroom or outlet according to the day or night timing. Thus, it will give the visitors a relaxing and new feel every time they visit your outlet.

Accent Lighting

You can use tunable white LED strips as accent lighting on stairs, under shelves, and in coves. They will allow you to control the light color temperature as per your mood or needs.

Task Lighting

The lighting requirement for everyone is different. Some like to work in warm lighting that creates a cozy environment. In contrast, others prefer cool lighting for an energetic vibe. In solving these problems, tunable white LED strips work best. You can use them on your workstations and study/reading areas. And thus control the lighting as per your comfort zone.

Museums and Exhibition Lighting

Subtle and aesthetic lighting are essential for museum and exhibition lighting. In this case, tunable white LED strips work best. You can use them to highlight the exhibited products. Besides, they are great for accent lighting in museums.

How To Install a Tunable White LED Strip

Tunable White LED Strip installation is a simple and easy process. But you should remember that the process will go much more smoothly if you have all the necessary supplies. The simplest method for installing the tunable white LED strip is described below:

Installing Requirements:

1. Tunable white LED strips
2. Driver
3. Receiver
4. Controller

Step-1: Know The Wires

Tunable white LED strips have three wires- one for warm white, one for daylight, and a positive wire. Remember, the color of the cables varies from br

and to brand. So, before installing the strips, know about the cables from the manufacturer’ s specifications.

Step-2: Connect the Strips To the Receiver

Take the tunable white LED strips to your required measurement. Now take two receivers to connect both ends of the LED strips. You will find marks in the receiver for each wire connection. Connect the warm lighting wire of the strips to the red negative of the receiver and the daylight wire to the green negative. Now connect the remaining positive wire of the tunable LED strips to the red positive of the receiver.

Step-3: Join the Receiver to The Driver

You will notice two sets of positive and negative input marks on the other end of the receiver. Now take the driver; find the negative and positive wirings and connect to the receiver accordingly. Ensure that the wires are neatly connected and not touching each other.

Step-4: Connect the Controller to the Power Supply

Once the LED strips are linked with the receiver and driver, it’ s time to connect them to the controller. Find the negative and positive ends of the driver and connect them to the controller appropriately.

Step-5: Ready To Set

Once you are done with the wirings, test the tunable LED strips and confirm they work correctly. Now, they are all set to glow!

A Guide to Choosing Tunable White LED Strips

Although selecting a Tunable White LED Strip is quite simple, there are a few things to keep in mind. The features listed below are things to consider when buying a tunable white LED strip.

Check CCT

The CCT determines the shades of the light color for different temperatures. However, the tunable white LED strips are available in two CCT ranges, 1800K to 6500K and 2700K to 6500K. Higher temperature brings out warmer yellowish light, and lower temperature gives cool white lighting.

Check CRI

The CRI, or Color Rendering Index tells you about the light color accuracy. The quality of the colors will improve as you increase the CRI. However, it is essential to select a CRI of at least 90 to ensure that your strip will not produce any colors that are problematic.

Brightness level

When the brightness is taken into account, Lumen is usually used. So, brighter colors are indicated by higher lumen. The ideal range for accent lighting is 200 - 500lm/m. If you want bright lighting in your space, choose a more excellent lumen rating.

Heat Dissipation

How well your LEDs resist overheating depends on the condition of the chips used in them. Usually, choose a high-quality one to prevent overheating and burning when the temperature is changed several times.

Strip Width & LED Size

The tunable LED strips' lighting effect varies with the trip's width. For instance, a wider LED strip with larger LEDs will give more prominent lighting than a thinner one with tiny LEDs. So, before purchasing tunable LED strips, consider the width of the strips.

LED Density

Low-density LED strips create dots. In contrast, a highly dense tunable LED strip is always preferable due to its smooth lighting effect. So, consider the density of LED flex before choosing one. And always go for higher LED density.

IP rating

IP or Ingress Protection rating refers to protection against liquid and solid substances. The higher the IP rating, the better protection it provides. For example- if you need tunable white LED strips for your bathroom, go for IP67 or IP68.

Warranty

The warranty of a product ensures product quality and durability. So, always go for Tunable white strips with long warranty policies. However, in this case, you can go for LEDYi. Our tunable white LED strips come with a 5-years warranty.

Tunable White LED Strips Vs Dim-To-Warm LED Strips

Tunable white and dim-to-warm white are excellent for white lighting. But you may need clarification in choosing between these two. No worries, the below difference chart will clear your confusion-

Tunable White LED Strip	Dim-to-warm LED Strip
Tunable white LED strips can bring warm to cool white light tones.	Dim-to-warm LED strips are designed for adjustable warm white lighting.
You can adjust any temperature that falls into the range of tunable white LED strips.	It has a pre-set color temperature.
These strips are available in two ranges- 1800K to 6500K & 2700 K to 6500 K.	Dim-to-warm LED strips range from 3000 K to 1800 K.
The brightness in tunable white LED strips does not depend on color temperature. So you can control the brightness of every shade.	The highest temperature of Dim-to-warm LED strips is its brightest shade.
Tunable white LED strips require a LED controller for adjusting the color temperature.	It is controlled by a dimmer.

Tunable White LED Strips Vs RGB LED Strips

Tunable white LED strips and RGB LED strips have different lighting effects. The differences between these two types of LED strips are as follows:

Tunable White LED Strips	RGB LED Strips
Tunable white LED strip deals with different shades of white.	RGB LED strips consist of a 3-in-1 LED chip. And it deals with colorful lights.
Such LED strips have an adjustable color temperature system for switching light colors.	It mixes the three primary colors to create different light effects.
The light color range for tunable white LEDs is limited.	The light color range for RGB LED strips is thousands of times more than the tunable ones.
It brings white shades from warm to cool tones.	Combining red, green, and blue colors, an RGB LED Strip can make millions of hues!
Tunable white LED strips can’t produce colorful lights. They are suitable only for white shades of light.	Besides colorful lighting, RGB can produce white by mixing red, green, and blue lights at high intensity. But the white light produced by RGB is not pure white.

Therefore, these are the differences between tunable white and RGB LED strips.

1800K-6500K Vs 2700K-6500K- Which Range of Tunable White LEDs is Better?

Compared to 2700K-6500K adjustable white LED strips, the 1800K-6500K tunable white LED strips provide a more extensive range of color temperatures. And this strips provide you with more warm white variations. So, choosing this range will be great for you if you are a yellow-orangish-white lover. Set them to your bedroom to get a mild candlelight effect at 1800K with this ra

nge. Yet if you are not too fond of warm lighting, you can go for 2700K-6500K range.

Dim To Warm – What It Is and How Does It Work?

Have you ever thought about how light can influence your mood? Phycology says a warm light relaxes your mind and body, creating a cozy ambiance. Likewise, our bodies respond differently to varying light intensities and colors. And to apply this color game to your lighting, you must know what dim to warm is and how it works.

Dim to warm is a lighting technology to adjust the warm tone of white lighting, creating a candle-like effect. It dims the lights controlling the flow of current. The working mechanism of dim to warm depends on the color temperature of the light. As the light dims, it decreases the color temperature creating warmer white shades.

I’ve comprehensively discussed dim to warm in this article, its working mechanism, applications, and many more. So, let’s get begin-

What is Dim to Warm?

Dim to warm is a light-dimming technology to bring different shades of a warm white. Adjusting the color temperatures of these lights, you can get a variety of warm hues.

These lightings provide a yellowish to orangish white shade. And such warm lights are great for creating an aesthetic and cozy atmosphere. That is why dim-to-warm lights are trendy for lighting bedrooms, living rooms, kitchens, workspaces, etc.

Dim to Warm: How Does It Work?

Ever noticed a dimmable incandescent bulb? Dim-to-warm technology has quite similar mechanisms to dimmable incandescent bulbs. The only difference is that the light’ s intensity in such bulbs reduces, decreasing the current flow. But in LEDs with dim-to-warm, the color temperature is reduced to bring a warm white tone.

In this technology, changing the color temperature from 3000K to 1800K, various shades of white are produced. The light with the highest color temperature has the brightest hue. As you dim the light, it reduces the current flow inside the chip. As a result, the temperature of the color falls, and warm light is produced.

Color Temperature	Brightness	Appearance
3000 K	100%	Daylight white
2700 K	50%	Warm White
2400 K	30%	Extra Warm White
2000 K	20%	Sunset
1800 K	10%	Candlelight

So, you can see in the chart that the brightness of light decreases with the color temperature creating a warm hue. And in this way, the dim-to-warm technology works by adjusting the color temperature.

Dim to warm LED strips have two different working mechanisms based on the chip structure. These are as follows-

1. **Dim to Warm LED Strip Without IC Chip**

The dim-to-warm LED strip without an Integrated Circuit (IC) chip combines red and blue chips to form warm hues. The blue-chip has a higher color temperature in such LED strips than the red chip. So, when you dim the light, t

he voltage of the blue-chip reduces faster to create a warm hue. Thus, adjusting the color temperature of red and blue chips creates a warmer glow.

2. **Dim to Warm LED Strip With IC Chip**

Dim-to-warm LED strips with an independent chip (IC) control the current flow inside the chip. So, when you dim the LEDs, the IC chip adjusts the current flow and lowers the color temperature. As a result, it produces a cozy warm hue. And thus, dim-to-warm LED strips create a warm tone when dimmed.

Types Of Dim to Warm LEDs

There are different types of dim-to-warm LEDs. These are as follows-

Dim to Warm Recessed Lighting

Installing recessed lighting to the ceiling creates an ambient appearance. And to make this outlook more cozy, dim to warm, recessed lighting works best. It adds a natural sunlight vibe to the room with warm white shades.

Dim to Warm LED Downlight

The dim-to-warm LED downlight brings a candle-like effect to your house or office. Besides, as these lights point downward, you can use them as a spot light to focus on any part of your room.

Dim to Warm LED Strip

Dim-to-warm LED strips are flexible circuit boards with dimmable LED chips. These chips in LED strips can change the color temperature of the light up to a fixed range to emit warm white shades. Dim-to-warm LED strips are more convenient than other dim-to-warm lighting forms. They are flexible and bendable. Plus, you can cut them to your desired length. These LED strips are suitable for accent, cabinet, cove, or commercial lighting.

The dim to warm LED strips can be of two types based on the diode or chip arrangement within the strip. These are-

- **Dim To Warm SMD LED Strip:** SMD refers to Surface Mounted Devices. In dim to warm SMD LED strips, numerous LED chips are populated within t

he printed circuit board. However, LED density is a crucial factor to consider in SMD LED strips. The higher the density, the lower hotspot it creates. So, when choosing SMD LED strips, make sure to check the LED density.

- **Dim To Warm COB LED Strip:** COB refers to Chip On Board. In dim to warm COB LED strips, numerous LED chips are connected directly to a flexible circuit board to form a single unit. Such dim-to-warm strips do not create hotspots. So, you can get dotless lighting with dim to warm COB LED strips.

Dim to Warm LED Bulbs

The dim to warm LED bulbs are available in various sizes. They are long-lasting and budget-friendly. Besides, you can use them creatively to create aesthetic outlooks for your interior design.

Therefore, these are the different types of dim to warm LED light. You can choose the one that suits you best.

Things To Know About Dim To Warm LED Strip

To get a better idea about dim to warm LED strips, you should have some basic idea about them. Here I've listed some essential facts for your convenience-

Color Temperature

The color temperature (CCT rating) is the most crucial factor when installing a dim to warm LED strip. CCT means Correlated Color Temperature and is measured in Kelvin. In the case of dim to warm, the temperature of color ranges from 3000K to 1800K. The lower the color temperature, the warmer the tone. But which temperature is ideal for your lighting project? No worries about it because you can control these temperatures according to your preferences. Yet, I've suggested some excellent CCT ranges for regular lighting purposes-

Recommendation For Dim to Warm

Area	CCT Range
Bedroom	2700K
Bathroom	3000K
Kitchen	3000K
Dining Room	2700K
Working Space	2700K/3000K

For the bedroom and dining area, a warmer tone (orangish) will give a cozy vibe. Considering that, 2700 K is ideal for lighting these spaces. Again, a yellowish-warm tone at 3000K works well for more functional areas like the kitchen or bathroom. However, in dimming your working space, you can go for 2700K or 3000K, anyone that seems comfortable to your eye.



Dimming Power Supply

The dimming power supply should be compatible with the dim-to-warm LED strip. For instance- a dim to warm LED strip with a red and blue chip combination requires a voltage-regulated dimmer. But, the one that includes IC chips is compatible with PWM output dimming.

In choosing between these two categories, going for a dim-to-warm LED strip with an IC chip is a better option. That is because these strips' PWM dimming power supply is readily available. So, no worries about finding them.

Length Of Strip

You should know the strip length when buying dim to warm LED strips. Usually, the standard size of a dim-to-warm LED strip roll is 5m. But LEDYi offers customizable options for length adjustment on all LED strips. So, contact us for customized dim to warm LED strips.

LED Density

The density of dim-to-warm LED strips determines the outlook of the lighting. So, a high-density LED strip gives better output as it eliminates hotspots. You can get 224 LEDs/m or 120LEDs/m going for LEDYi dim-to-warm LED strips.

CRI Rating

The Color Rendering Index (CRI) rates the accuracy of colors. So, the higher the CRI rating, the better the visibility. Yet, always go for CRI>90 for the best color accuracy.

Flexible Sizing

Dim to warm LED strips should have a minimal cutting length for flexible sizing. That's why LEDYi gives a minimum cutting length of 62.5mm. So, with our LED strips, no worries about sizing.

Dimension Of LED Chip

The lighting of dim to warm varies with the dimension of LED chips. Therefore, the illumination of LED strips with more extensive sizes seems more prominent. For instance, an SMD2835 (2.8mm 3.5mm) dim-to-warm LED creates a thicker glow than SMD2216 (2.2mm 1.6mm). So, choose the dimension of the strip as per your lighting preferences.

Easy Installation

For easy installation, dim-to-light LED strips come with premium 3M adhesive tape. With these, you can easily mount them on any surface without worrying about falling.

IP Rating

Ingress Protection (IP) rating determines the level of protection of LED strips from adverse weather conditions. In addition, this rating determines whether the light is dust, heat, or waterproof or not. For example- an LED strip with IP65 indicates its resistance to dust and water. But they can't be submerged. On the other hand, a dim to warm LED strip with IP68 can submerge in water.

For more information, you can read [A Guide to Waterproof LED Strip Lights].

Voltage Drop

The [voltage drop] increases with the increment of length, which affects LEDs efficiency. That is why a thicker PCB (Printed Cable Board) helps to minimize the voltage drop. LEDYi keeps the PCB thickness to 2oz to optimize this voltage drop. Thus, our dim to warm LED strips do not get overheated, preventing excess voltage drop.

So, before installing a dim to warm LED strip, you should learn enough about these facts to get the best deal.

Benefits Of Dim To Warm

The dim to warm lights play a crucial role in creating a comfortable atmosphere. It creates a pleasant ambiance that gives you relaxation.

The candle-like glow of dim to warm light helps you to sleep peacefully. It brings out natural lighting that creates a calming environment around you. In addition, our body secretes the melatonin hormone that controls our sleep cycle in warm lighting. So, for healthy sleep, dim to warm lighting can be of great help.

Besides these health benefits, dim to warm also uplifts your interior designs. The warm lighting can bring an aesthetic look to your decoration.



Applications Of Dim to Warm LED Strip

Dim to warm technology is suitable for various purposes. Here I've highlighted some common ways to apply this lighting technology-

Accent Lighting

Dim-to-warm LED strips elevate the texture of any object in your room. That is why you can use them as accent lighting. For example, placing them under the staircase or below or above walls will give an ambient look.

Cabinet Lighting

You can use dim to warm LED strips above or below cabinets to create an elegant look. Besides, installing them below the cabinet will give you better work visibility. For example, lighting under the kitchen cabinet provides you with enough lighting to work at the workstation beneath it.

Shelf Lighting

In lighting the shelf of your house or office, you can use dim to warm LED strips. It could be a bookshelf, cloth shelf, or shoe rack; dim to warm lighting works best in uplifting their appearance.

Cove Lighting

Cove lighting is excellent for creating indirect lights at home or office. You can use dim to warm LED strips on your ceiling to create cove lighting. It will give a nice cozy appearance to your bedroom or living area.

Lobby Lighting

You can use dim to warm LED strips in the hotel or office lobby. The warm tone of such lighting brings a sophisticated look to your interior design.

Toe kick lighting

The Toe kick lighting illuminates the floor of the bathroom or kitchen. Going for a dim to warm LED strip in floor lighting is a wise decision. Plus, you can experiment with the lighting outlooks to change the color temperature.

Background Lighting

In lighting the background of your monitor or any artwork, dim to warm LED strips can help. You can also install them on the back of your mirror. It will take your vanity outlook to the next level.

Commercial Lighting

Dim to warm LED strips are best for commercial lighting. You can use them in restaurants, hotels, showrooms or outlets, etc. They create a better atmosphere with cozy lighting and thus attract customers.

Besides all these applications, you can also go creative in using them.

Types Of Dimmers

Dimmer is a crucial part of dim to warm LEDs. It controls the current flow of the light. And so, to control the intensity or color temperature of lights, a dimmer is essential. Here I' ve listed some of the standard types of dimmers for your convenience-

Rotary Dimmer

Rotary dimmers are the most traditional category of light dimmers. It has a dial system. And when you rotate the dial, the intensity of the light decreases, creating a dim effect.

CL Dimmer

The letter 'C' of the term CL is derived from CFL bulbs, and 'L' is from LEDs. That is, CL dimmers are compatible with these two types of bulbs. This dimmer has a lever or switch-like structure to control the lighting.

ELV Dimmer

Electric Lower Voltage (ELV) dimmer is compatible with low-voltage halogen light. It dims the lamp by controlling the power supply of the light.

MLV Dimmer

Magnetic Low Voltage (MLV) dimmers are used in low-voltage fixtures. They have a magnetic driver to dim the bulb.

0-10 Volt Dimmer

In a 0-10 volt dimmer, the current flow in the light decreases when you switch from 10 to 0 volts. So, at 10 volts, the light will have the maximum intensity. And will dim at 0.

Integrated Dimmers

Integrated dimmers are the most modern category of light dimmers. They are very convenient to use. And you can efficiently operate them using a remote or smartphone.

So, these are the most common types of dimmers. However, before selecting any one from these, you must ensure they are compatible with your light.

For more information, you can read How to Dim LED Strip Lights.

Dim To Warm Vs. Tunable White - Are They Same?

Dim to white and tunable white may often confuse you. Many of us consider them the same, as they both deal with shades of white. But these two lights are not the same. The differences between these two lightings are as follows-

Dim To Warm	Tunable White
Dim to warm LED strips bring out only the warm shades of white.	Tunable white LED strips can emit warm to cool shades of white.
The color temperature for dim to warm LED strips ranges from 3000 K to 1800 K.	The range in tunable white LED trips is from 2700 K to 6500 K.
It has a pre-set color temperature.	You can choose any temperature that falls into the range.
The highest temperature is the brightest shade for dim to warm.	The brightness of the light doesn't depend on color temperature. That is, you can control the brightness of each shade.
Dim to warm are connected to dimmer.	It requires a connection to a tunable white LED controller for color changing.

So, Seeing all these differences, now you know that dim to warm and tunable white are not the same. One provides only warm tones, whereas the other brings all shades of white from warm to cool. Yet, tunable white gives you more color-changing options than dim to white. And that is why they are also quite expensive compared to dim to warm.

For more information, you can read Dim to Warm VS Tunable White.

How Does A Dim to Warm Light Appear When Not Dimmed?

Dim to warm lights look the same as other LED bulbs when not dimmed. It creates a warm yellowish hue when you dim it, which is the only difference. But the regular LED bulls produce bluish or pure white shade. Aside from these, there isn't any difference in the outlook of ordinary and dim to warm lighting.

The Certification of LED Strip Lights

Certificates are a way of assuring quality. They show that a product or service has been tested and meets specific standards. Various organizations, including the government and private companies, can issue certificates.

Led strips are one type of product that can benefit from certificates. Certificates can assure buyers that the strips have been tested for safety and quality. This is important, especially given the many led strips available on the market.

The classification of the certification

There are three main ways to classify certification. There are three main ways to organize certification.

The first classification is based on market accessibility. Market access means whether the certification is mandatory or optional according to the laws and regulations of a country or region. Market access is divided into mandatory and voluntary.

The second classification is based on the requirements for certification. Certification requirements generally include safety, electromagnetic radiation, and energy efficiency.

The third classification is the region of application of the certification. Applicable region refers to the certificate appropriate in which country or region, such as CE certification, is applicable in the EU, while CCC certification is applicable in China.

Why LED Strip Certification is Important

Ensures LED strip’s high quality

Because the certification will require the LED strip to go through a series of rigorous tests, only when the test passes the LED strip will be certified. Therefore, the purchaser can quickly determine the quality of the LED strip as long as he sees that the LED strip has obtained the corresponding certification.

Ensure LED strip can be imported successfully

Some certifications are mandatory, and only after obtaining the certificate can the LED strip be sold in the corresponding country. For example, LED strips can be sold in the EU only if they have obtained CE certification.

Common LED Strip Certifications

What are the certifications of LED strip lights?

There are many certifications on the market for LED strips, and if all of them we need to know, it will take too much time.

So, to help beginners quickly understand the certification of LED strips, I give the most common LED certification here.

Certificate Name	Applicable Area	Mandatory or Voluntary	Requirement
UL	United States	Voluntary	Safety
ETL	United States	Voluntary	Safety
FCC	United States	Mandatory	EMC
cULus	Canada	Voluntary	Safety

CE	European Union	Mandatory	Safety
RoHS	European Union	Mandatory	Safety
Ecodesign Directive	European Union	Mandatory	Energy efficiency
CCC	China	Mandatory	Safety
SAA	Australia	Mandatory	Safety
PSE	Japan	Mandatory	Safety; EMC
BIS	India	Mandatory	Safety
EAC	Russia	Mandatory	Safety
CB	International	Mandatory	Safety; EMC
SABER	Saudi Arabia	Mandatory	Safety

UL Certification

UL is a world-renowned safety certification company. It was founded in 1894 as the Underwriters' Laboratories of America. UL is best known for its safety certification of electrical products. Today, UL certifies products in more than 100 countries.

ETL Certification

ETL stands for Electrical Testing Laboratories, the certification division of Intertek Testing Laboratories, who are also part of the NRTL program and provide assurance, testing, inspection, and certification services for a huge range of industries.

FCC Certification

An FCC certificate is an official document that is issued by the Federal Communications Commission (FCC) in the United States. This document confirms that a product or piece of equipment meets all of the applicable FCC requirements and has been tested and certified by an accredited laboratory. In order to obtain an FCC certificate, a manufacturer or distributor must submit a completed application to the FCC and pay the applicable fees.

cULus Certification

The cULus certificate is a safety certification that is recognized by the United States and Canadian governments. The cULus certificate indicates that a product has been tested and meets the safety requirements of both countries. Many products, including appliances and electrical equipment, require the cULus certificate in order to be sold in the United States and Canada.

CE Certification

CE stands for “Conformité Européenne” and is a certificate that assures the compliance of a product with European Union health, safety, and environmental protection standards. The CE mark is affixed to products by their manufacturers and must be present on products sold in the EU. The CE mark indicates to consumers that a product has been assessed and found to meet all relevant EU health, safety, and environmental protection requirements. CE certification includes EMC and LVD.

RoHS Certification

The Restriction of Hazardous Substances Directive, or RoHS certificate, is a directive passed by the European Union in 2006 that restricts the use of certain hazardous materials in electrical and electronic equipment. The directive requires that all products sold in the EU meet certain environmental criteria, and one way to demonstrate compliance is to obtain a RoHS certificate.

Ecodesign Directive

The Ecodesign Directive is a certificate that is issued by the EU. It is designed to help reduce the environmental impact of products. The directive sets out specific requirements for the design of products, in order to make them more energy efficient and environmentally friendly.

CCC Certification

Certificate of Conformity of China (CCC) is a mandatory certification system for products sold in the Chinese market. The CCC mark is a sign of quality and safety, and products with the mark are guaranteed to meet Chinese standards.

The CCC certification process is rigorous, and only products that pass all tests are awarded the mark. Manufacturers must submit detailed product information, including test results and safety data sheets, to a government-approved testing lab. Products are then tested against Chinese safety standards.

The CCC mark is recognized throughout China, and products with the mark can be sold anywhere in the country. The certification is also accepted in some other Asian countries, such as Taiwan and South Korea.

SAA Certification

SAA is the abbreviation of the Standards Association of Australian, which is the institution that sets Australian standards. As a standard-setting body, SAA was renamed Standards Australia in 1988 and changed to a limited company in 1999, called Standards Australia International Limited. SAI is an independent joint stock company. There is no so-called SAA certification. However, because Australia does not have a unified certification mark and the only certification body, many friends refer to the Australian product certification as SAA certification.

PSE Certification

Public Service Enterprise (PSE) certificates are an essential part of doing business in Japan. Introduced in 2002, PSE certificates are mandatory for companies that want to provide goods or services to the Japanese government.

To get a PSE certificate, a company must prove that it is trustworthy and has good business practices. This is done by submitting financial reports and other documentation to the Japanese Ministry of Economy, Trade and Industry (METI).

Once a company has been approved, it will be issued a PSE certificate. The certificate is valid for three years, after which the company must reapply.

A PSE certificate is important because it shows that a company is reliable and can be trusted to do business with the Japanese government. It also helps companies build credibility with potential customers in Japan.

BIS Certification

BIS certificate is an important document that is issued by the Bureau of Indian Standards (BIS). It is a certificate of conformity that confirms that the product or material mentioned in the certificate conforms to the Indian standard. The BIS certificate is mandatory for all products or materials that are sold in India.
The BIS certificate is also recognized internationally and it is accepted in many countries. Manufacturers who want to export their products to other countries must obtain a BIS certificate. The BIS certificate helps to ensure that the products meet the quality standards of other countries.
The Bureau of Indian Standards (BIS) is the national standardization body of India. It was established in 1947 and it is headquartered in New Delhi.

EAC Certification

The Customs Union Certificate of Conformity (EAC certificate) is an official document confirming the conformity of the quality of production with the approved standards within the Customs Union region.

The EAC Certificate can be used in the exports of goods to any one of Russia, Belarus, Armenia, Kyrgyzstan or Kazakhstan. The certificate is also valid on the territory of each country.

Typically the certificate of the Customs Union is issued for partial or serial production. In case the certificate is issued with a validity periof of more than one year, audits must be conducted not less than once a year. The EAC Certificate is issued with a maximum validity period of 5 years.

The Customs Union Certificate of Conformity is the easiest way to enter the markets of Russia, Belarus, Armenia, Kyrgyzstan and Kazakhstan at the same time.

CB Certification

CB CERTIFICATION. The IEC CB Scheme is multilateral agreement to allow international certification of electrical and electronic products so that a single certification allows worldwide market access.

SABER Certification

Saber is an electronic platform that helps the local supplier and factory to register the required conformity certificates electronically for consumer products, whether imported or locally manufactured, to enter the Saudi market. The platform also aims to raise the level of safe products in the Saudi market.

A SASO(Saudi Standards, Metrology and Quality Organization) CoC is a Certificate of Conformity that is specific to Saudi Arabia. This document certifies that the item has been successfully tested and inspected to meet the country’s quality and safety standards. The SASO certificate acts as a passport for the goods to clear customs

How to get certified: the testing process(UL Example)

Step 1: Vist the UL website and find the “Contact Us” page.

You can find links to all relevant information and forms for submitting product samples to UL testing here.

Step 2: Submit a sample product for UL to test.

The organization that obtains UL certification needs to prepare samples according to the requirements of UL certification and should pay the transportation fee when sending samples.

Step 3: UL began to evaluate samples in various aspects.

When UL receives your sample product, they will begin a safety evaluation. After UL has tested a product, it will be considered compliant with the standards and requirements or rejected for non-compliance.

Step 4: For manufacturers, UL requires factory inspection.

For manufacturers, UL will arrange for staff to inspect the factory on site. UL certification can only be obtained by simultaneously passing product testing and factory inspection.

Step 5: Obtained UL certification.

After the product is verified as safe and a factory inspection pass(if needed), a certificate will be issued by UL.

Your business will then be authorized to place the UL logo on the manufactured product. Audits will be performed intermittently to ensure the product keeps to the relevant guidelines and remains compliant with the UL standards.

Suggestions for applying for LED strip certifications

LED strip lighting has become popular in both residential and commercial applications due to its energy efficiency and long life.

To start an LED strip business, you must apply for some LED strip certification.

Here are a few suggestions for applying for LED strip certification.

The enterprises should have a targeted purpose.

There are a variety of certifications available, and businesses should first clarify the purpose of the certification they need.

For example, export LED strips should meet the certification requirements of the target market.

Different certifications require different technologies.

You should be aware of the product requirements for each certification. Especially when applying for multiple certificates simultaneously (such as CCC + energy-saving certification, CCC+ CB), you must consider them carefully. Otherwise, you may lose one of them. At the same time, enterprises must ens

ure that the mass-produced goods are of the same quality as the certified samples!

Enterprises should know the quality of the sample for certification.

Once the sample fails, the company has to increase the modification cost. Therefore, it is best for enterprises to carefully read the certification requirements, especially the product range, unit classification, testing plan, quality assurance, and other parts.

Enterprises should pay attention to the time limit of the certification.

Especially the long time for energy-saving certification. Enterprises should plan their time reasonably to avoid losses. In addition, enterprises should clearly understand the certification requirements, regularly track accreditation progress, communicate with the certification body, and self-monitoring through the network.

What is LED strip voltage drop?

The primary input voltage for LED strip lights is 12 Vdc and 24 Vdc, respectively. They are safe and easy to work with. But, we often hear this statement: The LED strip is brighter at one end and dimmer at the other. Why?

The answer is voltage drop. Actually, this is very normal in low voltage lighting systems.

What’s LED strip voltage drop?

LED strip voltage drop is the amount of voltage lost between the power supply and the LEDs themselves.
The greater the resistance in the circuit, the higher the voltage drop.

In the DC circuit of the led strip, the voltage will gradually diminish as it passes through the wire and the strip light itself. So, the extension of wire or strip will lead to one side of your strip lights being brighter than the other side.



Why LED strip voltage drop happen?

The first reason is any length of wire has a certain amount of electrical resistance. The longer the wire, the more the resistance. Electrical resistance causes a voltage drop, and voltage drop causes your LEDs to dim.

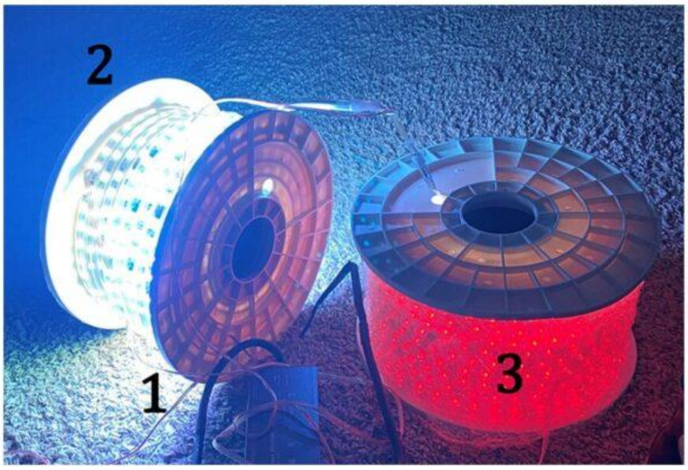
The second reason is the PCB itself has resistance. The resistance of the PCB will consume part of the voltage and convert the electrical energy into thermal energy.

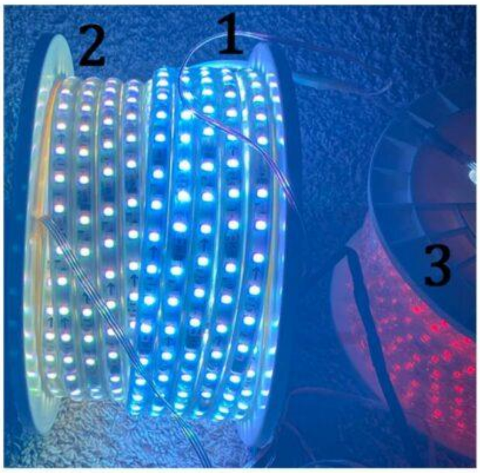
PCB resistance is related to the cross-section size (corresponding to the PCB board width and copper thickness). The larger the PCB cross-section, the smaller the resistance; the longer the PCB length, the greater the resistance.

How to find voltage drop?

The LED voltage drop is most noticeable on the white led strip so you can open the white light on the color-changing led strip to observe the voltage drop.

Let us see if we can see a voltage drop by running a long-distance white light led strip. In the below picture, we can see that the beginning (position “1”) is clear white, and after running for a distance (position “2”), the white light gradually turns yellow, and at the end of the led strip (position “3”), the white light turns red due to the decrease in voltage.





(Reminder: When the led light strip is rolled, it should not be lit for a long time, which will damage the led strip.)

LED strip voltage is related to LED chips. Below are the forward voltages required for several color chip drives.

- Blue LED chip: 3.0-3.2V
- Green LED chip: 3.0-3.2V
- Red LED chip: 2.0-2.2V

Note: The white LED uses a blue chip and then adds phosphors on the surface.

The driving voltage of the blue chips is greater than that of the green and red chips. So when the voltage of the white led strip light drops, and the current voltage cannot meet the voltage required by the blue chips, the lig

ht strip will display yellow(green & red mixed color) and red because they are lower than the voltage required by the white light.

Do all LED strip lights have a voltage drop?

Basically, all low-voltage LED strips, such as 5Vdc, 12Vdc, and 24Vdc will have voltage drop problems. Because for the same power consumption, the lower the voltage, the greater the current. According to Ohm’s law, voltage equals resistance multiplied by current. The resistance of a conductor is constant. The greater the current, the greater the voltage drop. This is also the reason why people use high voltage to transmit electricity!

High voltage LED strips, such as 110VAC, 220VAC, and 230VAC, generally do not have the problem of voltage drop. For one end power feed, the maximum run distance of high-voltage LED light strips can be up to 50 meters. According to the power equal to the voltage multiplied by the current, the voltage of the high-voltage LED strip is 110V or 220V, so the current of the high-voltage LED strip is very small, so the voltage drop is also small.

The constant current LED light strip, generally 24Vdc, will not have the problem of voltage drop. Because constant current LED strips have ICs, these ICs can keep the current flowing through the LEDs constant. As long as the current through the LED is constant, the brightness of the LED is also constant.

In fact, the voltage of the constant current LED light will also decrease. For example, the voltage at the end of the constant current LED light strip will also be lower than the 24V. Under normal circumstances, a voltage drop will cause a drop in current through the LED, resulting in lower brightness. However, since there are ICs on the constant current LED strips, these ICs can keep the current passing through the LEDs constant, which needs to be within a specific voltage range (for example, 24V~19V).

Is LED strip voltage drop harmful?

LED strip voltage drop is typically not detrimental to the LEDs since it is a form where the voltage supplied to them is less than what was originally expected.

However, the voltage drop usually represents the conversion of electrical energy to the thermal energy of the resistor, which generates a lot of heat. This can cause problems if your LED strip is installed in or near heat-sensitive materials. 3M adhesives and LEDs are also somewhat thermally sensitive so excessive voltage drops can be a problem.

What Factors will affect the voltage drop?

According to Ohm's law, voltage is equal to current times resistance.

The resistance of the wire is determined by its length and size of the wire. The LED strip PCB resistance is determined by the length and the thickness of the copper in the PCB.

So, the degree of voltage drop of LED strips can be determined by the main factors: the total current of the LED strip, the length and diameter of the wire, the length of the LED strip and the thickness of the PCB copper.

The total current of the LED strip

Through the specification of the LED strip, we can know the power of the 1-meter LED strip, so that we can calculate the total power of the LED strip.

The total current of the LED strip is equal to the total power divided by the voltage.

So the greater the total power, the greater the total current, and thus the more severe the voltage drop. Therefore, the voltage drop of LED strips with high power is more serious than that of LED strips with low power.

Alternatively, the lower the voltage, the higher the current and the more severe the voltage drop. Therefore, the voltage drop of the 12V LED strip is more serious than that of the 24V strip.

The length and diameter of the wire

The resistance of the wire is mainly determined by the conductor's material, the conductor's length, and the conductor's cross-section.

The resistance of the wire is mainly determined by the material of the conductor, the length of the conductor, and the cross-section of the conductor.

The longer the wire, the greater the resistance, and the smaller the cross-section, the greater the resistance.

You can check out the Wire Resistance Calculation Tool to make calculations more straightforward.

The length and the thickness of the copper in the PCB

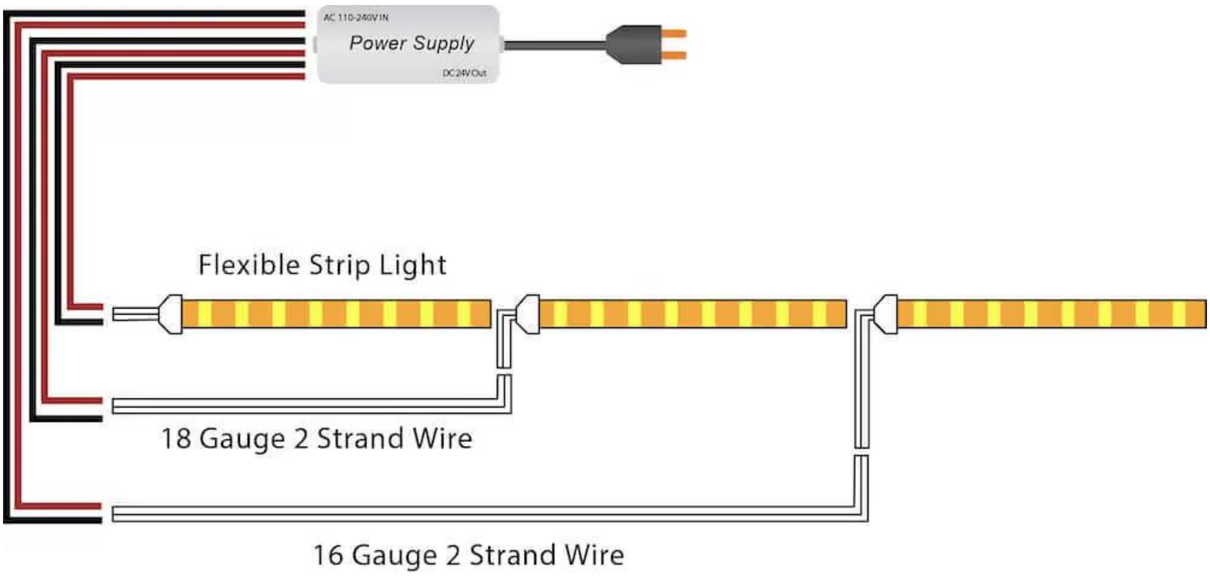
PCBs are similar to wires, they are both conductors and have resistance themselves. The conductive material in a PCB is copper. The longer the PCB, the greater the resistance; the larger the copper cross-section inside the PCB, the smaller the resistance.
You can check out the PCB Resistance Calculation Tool to make calculations more effortless.

How to Avoid Voltage Drop?

Although the LED strip will have the voltage drop problem, we can avoid it using the following methods.

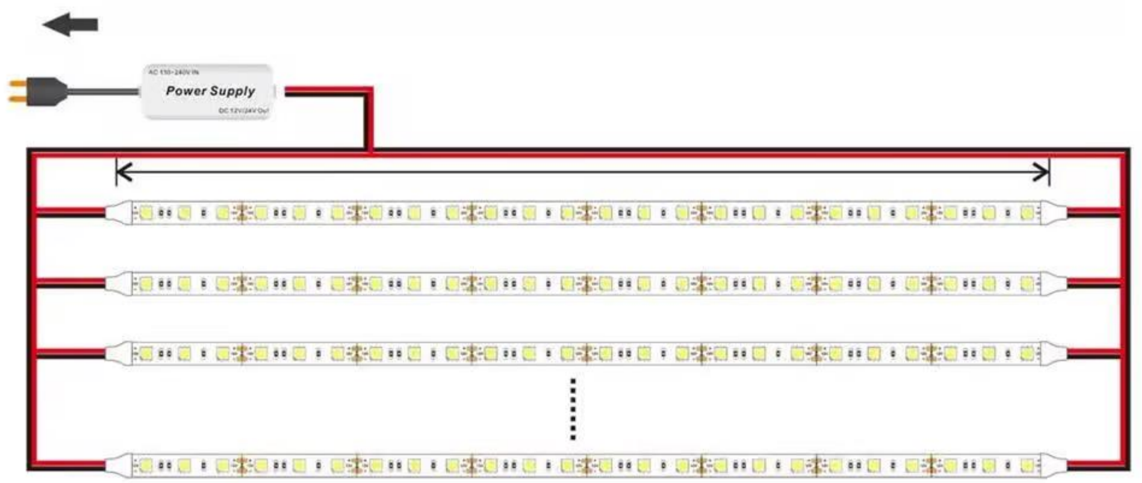
Parallel Connections

When longer LED strips need to be installed, it is recommended that every 5 meters of strips be connected to the power supply in parallel.



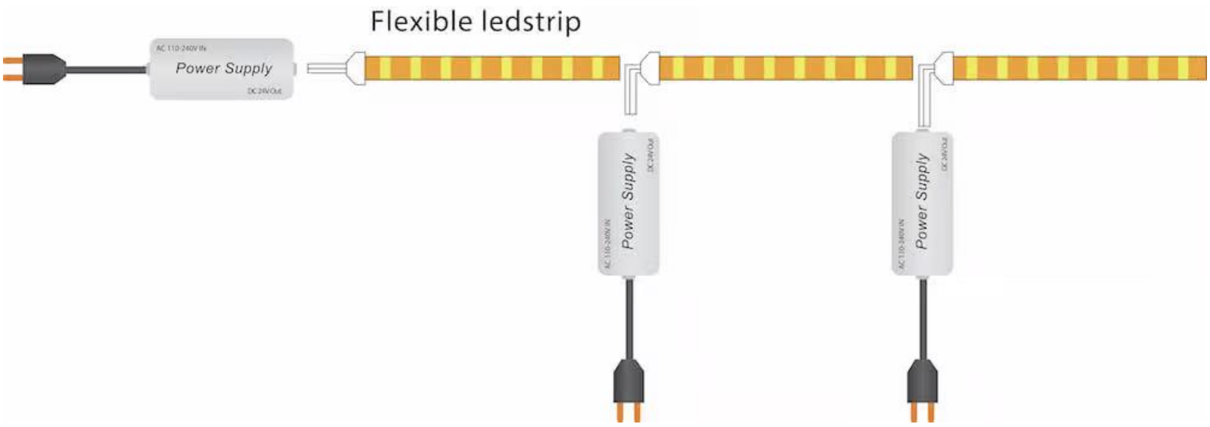
Power supply at both ends of the led strip light

The recommended maximum length of LED strips on the market is 5 meters. If you need to install a 10-meter LED strip, you can connect both ends of the LED strip to the power supply.



Use multiple power supplies

Using multiple power supplies instead of a single unit is a great idea to g et better brightness. It requires strategic planning, so you don’ t end up too far from the power source.



Use high voltage 48Vdc or 36Vdc LED strip

Use higher input voltage LED strips to avoid voltage drop issues.

For example, use 48V, 36V, and 24V instead of 12V and 5V.

Because higher voltage means lower current, lower voltage drop.

Use LED strips with thick copper PCB

Copper is the most commonly used material in electrical wiring. This is because it conducts electricity well and is relatively inexpensive compared to silver.

The thickness of copper is usually measured in ounces. The thicker the copper wire, the more current flows through.

We recommend using 2oz. or 3 oz. for high-power LED strips to avoid voltage drops.

The thicker the copper wire, the lower the internal resistance.

Therefore, the copper wire will carry more power efficiency.

In addition, it is better for heat dissipation.

Use big size wire

Sometimes, the place where the LED strip is installed is a long distance from the LED power supply. Then we must consider what size wire we need to use to connect the LED strip and the power supply. Of course, the bigger the wire size, the better. We need to know what the voltage drop is that we can accept, and know what this length of the wire causes the voltage drop.

You can determine the size of the wire by following the steps below:

Step 1. Calculate the Wattage

You can check the power per meter on the packaging label of the LED strip, so the total power is the power per meter multiplied by the total number of meters. Then divide the total power by the voltage to get the total current.

Step 2. Measure the distance between the LED strip and the driver

Measure the distance between the LED strip and the LED power supply. This directly affects wire size.

Step 3. Choose the right size wire

You can calculate the voltage drop of the wire using the Voltage Drop Calculator.

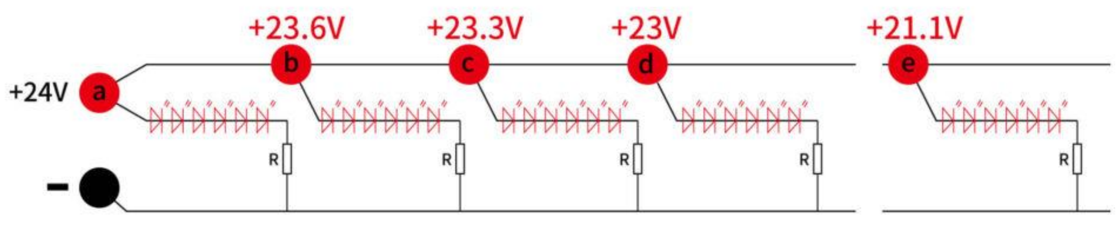
You can try changing different wire diameters in the calculator to see the voltage drop corresponding to different wire diameters.

This way, find a wire of the right size (with a voltage drop you can accept).

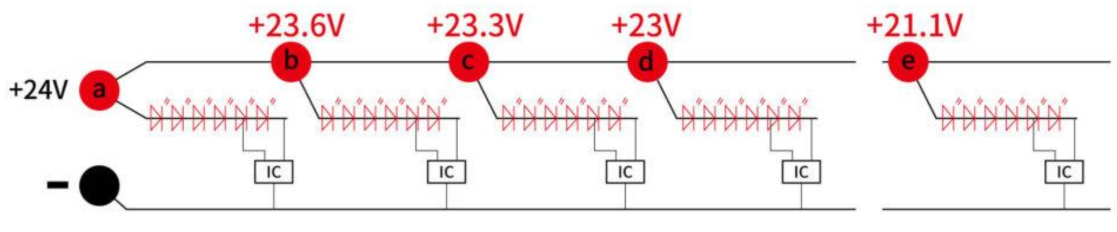
Use super long constant current LED strip

The super long constant current (CC) led strip light can achieve 50 meters, 30 meters, 20 meters, and 15 meters per reel, and only needs to be connected to the power supply on one end, and the brightness of the beginning and the end are the same.

By adding constant current IC components to the circuit, the super long constant current led strip can ensure that the current through the LED can be kept constant within a specific voltage range (for example, 24V~19V) so that the brightness of the LED is consistent.



Constant voltage led strip schematic diagram



Super long constant current led strip schematic diagram

A Guide to Waterproof LED Strip Lights

LED strip lights are a popular choice for adding lighting to a space. They are available in various colors and can be installed in several ways. One thing to consider when purchasing LED strip lights is whether or not they are waterproof. Many types of waterproof LED strip lights are available on the market, so it is important to know which type will work best for your needs.

What is an IP rating?

An IP rating, or Ingress Protection Rating, is a number assigned to a piece of LED strip to indicate the level of protection it offers against solid foreign objects and liquids. The rating is typically represented by two numbers, the first showing the protection against solid objects and the second against liquids. For example, an IP68 rating means the equipment is completely protected against dust ingress and can be submerged in water up to 1.5 meters for up to 30 minutes.

When do we need waterproof LED strips?

We don't always need waterproof LED strips. If you are starting, you may not need them yet. Most basic LED projects can be completed with non-waterproof LED strips. However, if you are working in a damp environment or plan to use your LED strips outdoors or underwater, waterproof LED strips are a must.

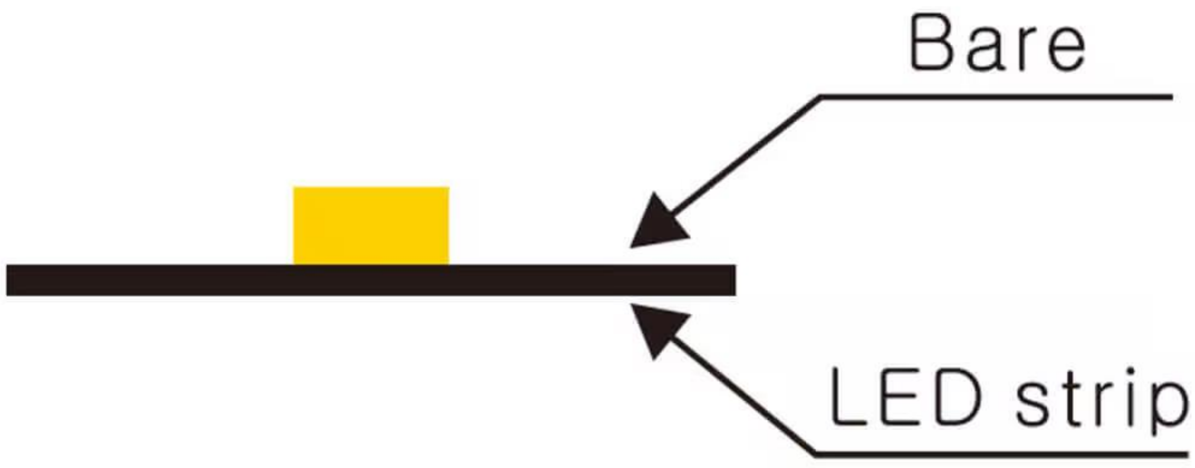
How many different waterproof grades of led strip lights?

There are a lot of different waterproof grades of led strip lights. It cannot be evident for beginners to know which one to choose. There are five waterproof grades: IP20, IP52, IP65, IP67, and IP68.

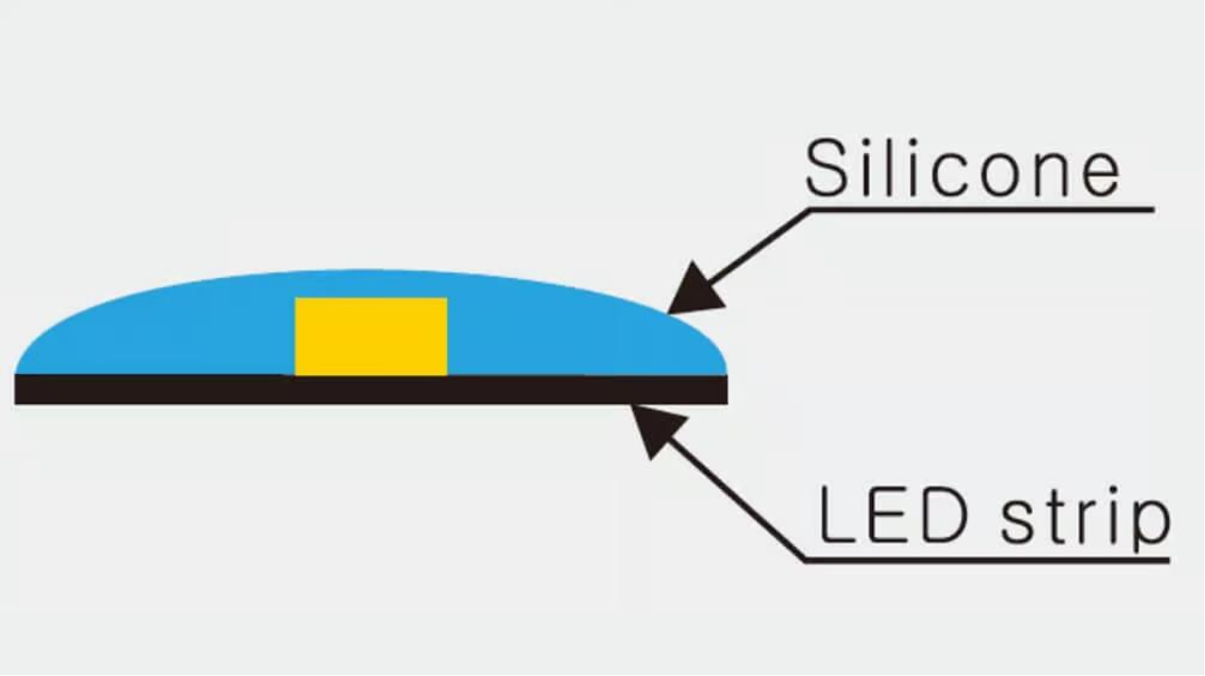
The grade you need depends on how you will use the led strip lights. If you use them for indoor decoration, then the IP20 grade will be fine.

IP20 none waterproof

IP20 is the lowest grade and is not water resistant at all. It is only meant for indoor use.



IP52 silicone coating



Waterproof process:

Add a layer of silicone to the LED strip light bead, but the other side is a bare PCB. IP52 LED strips can be dustproof, but the waterproof performance is poor.

Application:

Suitable for dry or wet areas, such as living rooms, kitchens, bathrooms. Not recommended for use in areas where water will be splashed.

Color shift:

Compared with the color temperature of the LEDs, the CCT of the finished product will become higher. For example, when producing 3000K IP52 LED strips, we cannot use 3000K LEDs, but only use LEDs with a lower CCT than 3000K, such as 2700K LEDs.

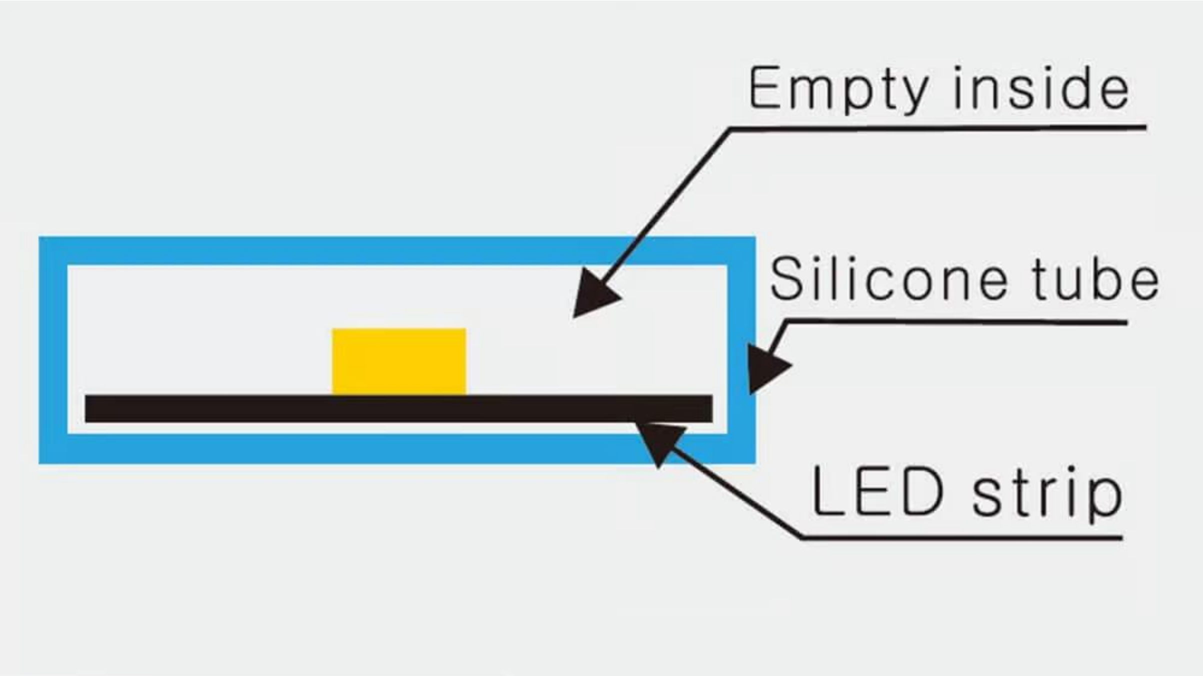
Brightness loss:

~10% lumen loss.

Dimensional changes:

Compared with the IP20 LED strip, the width has not changed, but the height has increased by about 1.5-2mm. Therefore, when we choose LED aluminum profiles, we do not need to consider additional width.

IP65 silicone tube



Waterproof process:

Add a silicone sleeve to wrap the LED strip by artificial or silicone extrusion. IP65 LED strips are dustproof and waterproof.

Application:

Suitable for wet or splashing areas, such as Kitchen, bathroom, eaves. Since the housing is hollow, it is not recommended for outdoor use.

Color shift:

Basically, there is no no color shift.

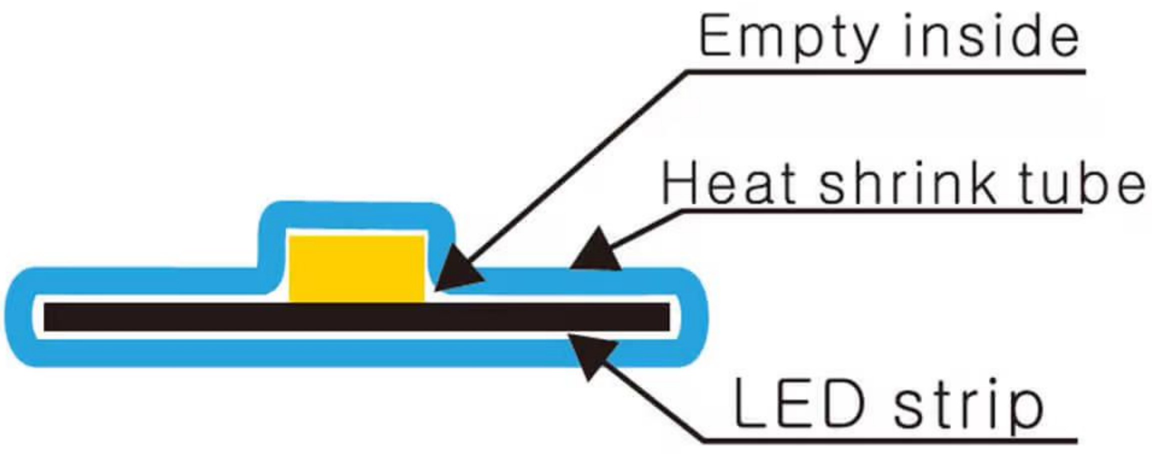
Brightness loss:

~5% lumen loss.

Dimensional changes:

Compared with the IP20 non-waterproof LED strip, the width and height of IP65 silicone tube LED strips are increased by about 2mm. When selecting LED aluminum profiles, you must take into account this increased size.

IP65H heat shrink tube



Waterproof process:

Add a heat shrink tube to wrap the LED strip. IP65H LED strips are dustproof and waterproof, the same as the IP65 silicone tube LED strip.

Application:

Suitable for wet or splashing areas, such as Kitchen, bathroom, eaves. Since the housing is hollow, it is not recommended for outdoor use.

Color shift:

Basically, there is no no color shift.

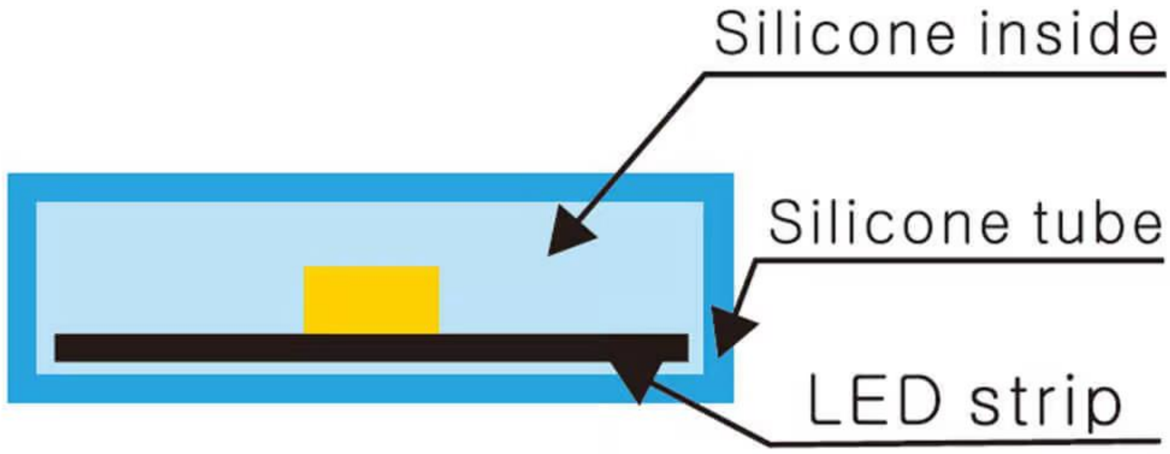
Brightness loss:

~4% lumen loss.

Dimensional changes:

Compared with the IP20 non-waterproof LED strip, the width and height of IP65H heat shrink tube LED strips are almost not changed.

IP67 full silicone encased



Waterproof process:

Wrap the LED strip with a hollow silicone tube. Then, the hollow silicone tube is filled with silicon to create a sealing effect.

There is another way to make IP67 LED strips, that is silicone integration extrusion.

Application:

Suitable for outdoor usage. However, because of the large molecular void of silicone, it is easy to seep water after a long time. As well as silicone it is not resistant to chlorine corrosion and is easily damaged. So it is not recommended for underwater use.

Color shift:

Similar to IP52 silicone coating LED strips, IP67 full silicone encased has the color shift, and the color shift’ degree is greater. For example, using 2700K LED beads, made into an IP52 LED strip, the color temperature may be 3000K, but made into an IP67 LED strip, the color temperature may be 3500K.

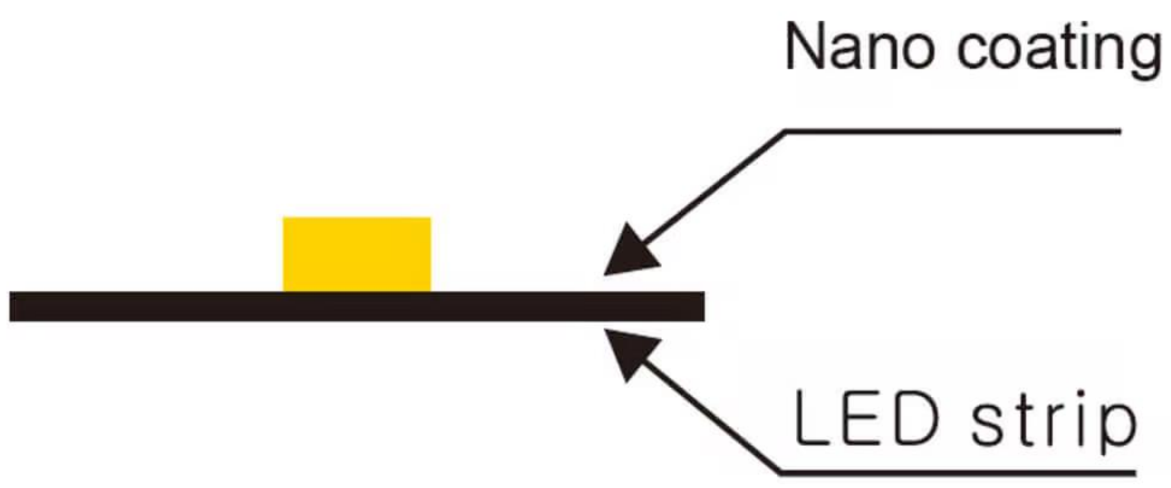
Brightness loss:

~15% lumen loss.

Dimensional changes:

Same as IP65 silicone tube LED strips, the width and height of IP67 full silicone encased LED strips are increased by about 2mm.

IP67 nano coating



Waterproof process:

By spraying a very thin nano-coating on the surface of the LED strip. The obvious disadvantage is that the IP67 nano coating LED strips cannot be cut.

Application:

Suitable for outdoor usage, underwater use is not recommended.

Color shift:

No color shift.

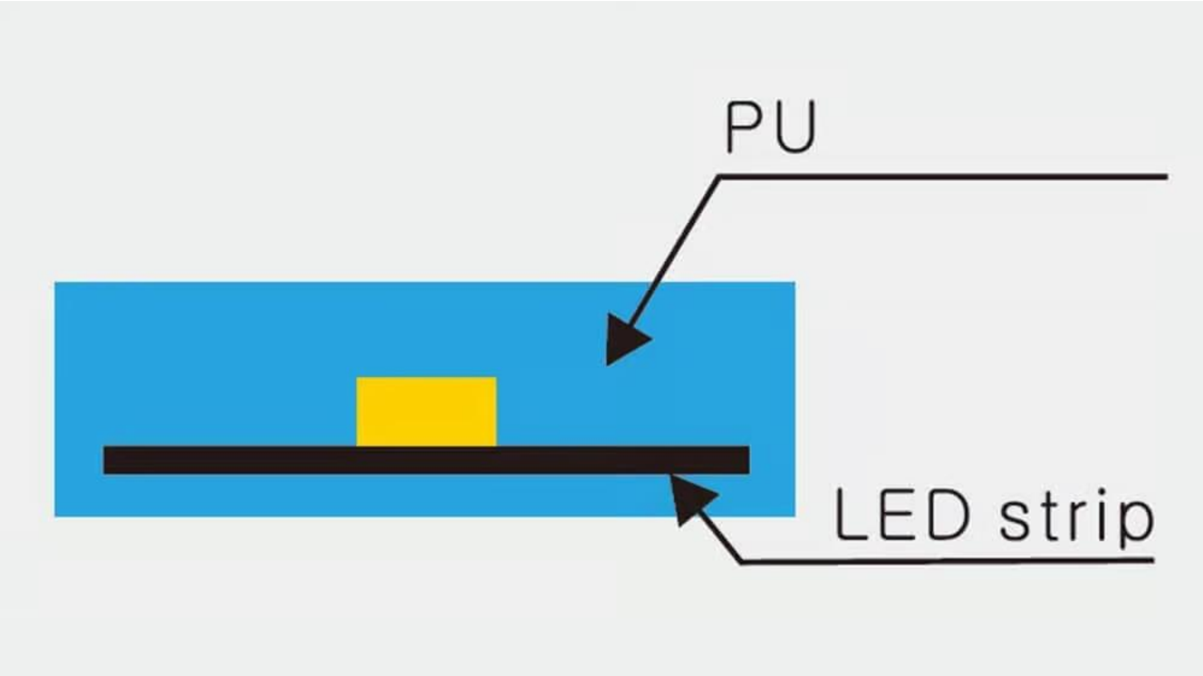
Brightness loss:

~2% lumen loss.

Dimensional changes:

No dimensional changes. The nano coating is very thin, so the IP67 nano coating LED strip looks the same as the IP20 non-waterproof LED strip.

IP68 full PU encased



Waterproof process:

Wrap the LED strip with full clear PU glue encased.

PU is short for Polyurethane.

Application:

Suitable for outdoor and underwater usage. Because the molecular gap of PU is small, it will not penetrate water, and it is resistant to chlorine, acid and alkali, so it is suitable for use underwater.

Color shift:

Similar to IP57 silicone full encased LED strips, IP68 full PU encased has the color shift.

Brightness loss:

~15% lumen loss.

Dimensional changes:

Same as IP67 silicone full encased LED strips, the width and height of IP67 full silicone encased LED strips are increased by about 2mm.

Confusion Between IP52 and IP65

Many other factories in the market mark the silicon coating LED strip as IP65. I’m afraid that’s not right because IP65 means it can be used in splashed places. But the back of silicon coating LED strips are exposed PCB, and the back is not waterproof. Incorrect use will cause damage to the LED strip.

The common material to make waterproof LED strips

The most common materials used to make waterproof LED strips are Epoxy resin, PU glue, and Silicone.
What is the difference between them? Let’s take a quick look.

Epoxy resin

Epoxy resin has the advantages of low cost, good workability, and low toxicity. Therefore, it is a popular waterproof material for most cheap LED strips on the market. However, it has a fatal flaw in its molecular structure.

Firstly, it has poor thermal conductivity, which will reduce the life of the light bar.

Secondly, the epoxy resin quickly turns yellow after half a year, and this yellowing will affect the color temperature of the strip.

In addition, epoxy resin cannot withstand high and low temperatures. It is easy to harden and crack when the ambient temperature is below 0° C.

PU glue

The cost of PU glue is higher than epoxy resin. It’s yellowing resistance, low-temperature resistance, and better thermal conductivity. However, it is toxic. Polyurethane adhesive will produce some small molecule compounds after curing. These compounds smell bad and are not suitable for health.

Secondly, it is not resistant to high temperatures. Do not use the adhesive strip with PU adhesive in places with an ambient temperature higher than 80 ℃.

Silicone

Silicone is the most costly. It is an environmentally friendly material with the advantages of PU glue and epoxy resin.
First of all, the heat resistance and low-temperature resistance are excellent.

The ambient temperature of -50° ~300° will not affect its structure and performance. We can use the silicon LED strip for saunas and refrigerators.

Secondly, the silicone glue will not turn yellow after a long time. This also ensures the long-term stability of LED strip color temperature. It is essential for high-end lighting projects such as hotels and yachts.

Due to the good thermal conductivity of silicone, it promotes the heat dissipation of the LED strip. However, we need to add aluminum channels for high power (over 20 W/m) strip lighting for thermal control.

Item	Epoxy Resin	Polyurethane Glue	Silicone
Cost	Low	High	Highest
Temperature resistance	0-60℃ Harden in low temperature	-40-80℃ Performance remained stable	-40-220℃ Performance remained stable
Heat conductivity	Low	High	High
Yellowing	Obvious after half a year	No	No
Toxicity	Low	High, bad smell	No

Light transmission rate	92%	95%	96%

What is silicone integrated extrusion?

Silicone integration extrusion is when the LED strip lights and solid silicone are extruded together through a mold and are shaped by high-temperature vulcanization.



Advantages of silicone integrated extrusion

Compared with the traditional waterproof process, the silicone integrated extrusion process has obvious advantages.

Infinite length

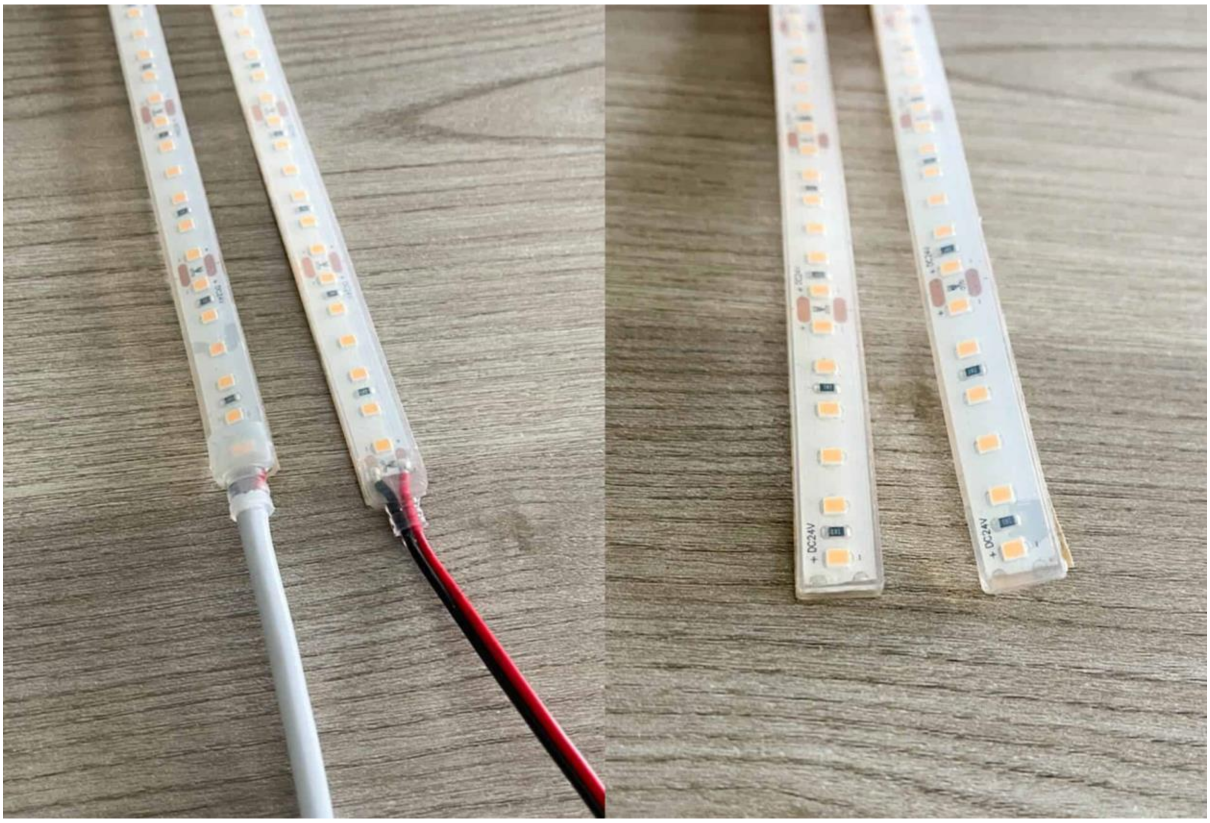
Through the silicone integrated extrusion process, the waterproof LED strips we produce can be infinitely long. Through the traditional waterproof process, the longest waterproof LED light strip is generally 10 meters.

High productivity

Most of the processes are automated in the silicone integrated extrusion process. And silicone can be cured by high-temperature vulcanization in just a few minutes. The traditional waterproofing process is done manually, and it takes up to 1 day for the silicone glue to cure naturally.

Better waterproof performance

Silicone The silicone integrated extrusion process uses solid silicone, which has better physical properties and is not easy to break. Combined with the one-piece injection-molded plug, the waterproof performance of the LED strip lights is better.



Silicone injection plug endcap

Process of silicone integrated extrusion

Compared with other traditional waterproof processes, the silicone integrated extrusion production process is more complicated and is mainly divided into the following four steps.

Step 1. Mixing silicone. The raw material of silicone is solid. Before production, we need to repeatedly knead the silicone with a machine to make it soft and remove the steam drum.

Step 2. The extrusion process begins with installing rolling LED strips on the payoff frame. These LED strips are adjusted and sequenced using an adjustment table.

Step 3. The LED strip and silicone are then passed through the holes in the pre-assembled die, activating the operating button on the electronic control box, which starts the machine to wrap the silicone onto the LED strip.

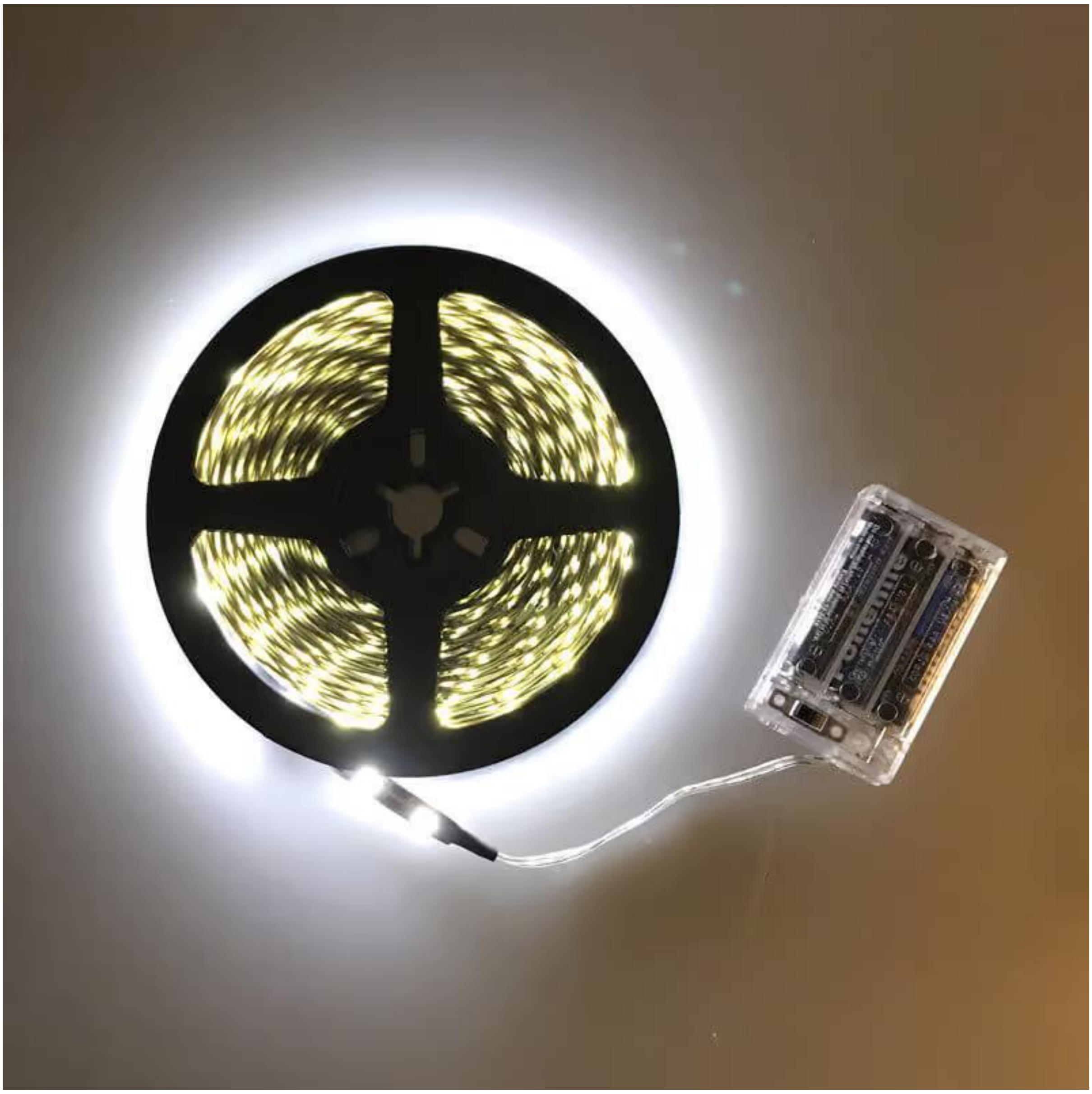
Step 4. The machine extrudes the silicone-coated LED strip and passes it through the vulcanizing oven, where the product is gradually vulcanized and shaped. The temperature inside the oven is kept moderate to avoid burning the LED beads. After vulcanization, the led strip is put out by a tractor.

How To Power LED Strip Lights With Batteries?

LED strip lights are great for adding some extra light to your home or office space. They come in various sizes, shapes, colors, and styles. If you want to add some additional lighting to your room, then LED strips might be the perfect choice for you.

But you can’t have a 220V plug ready to power an LED strip anywhere. So, at some point, for convenience, you may need to use batteries instead to power the LED strips. Batteries are handy if you’re in a place without power, such as camping or in a car.

Can I light up LED strip lights with batteries?



Yes, you can use any battery for lighting up LED strips. However, rechargeable batteries are recommended since they last longer and save energy.

Why do I need to use a battery to power LED strip lights?

The batteries are portable, so you can take them wherever you go. If you want to go camping outdoors, you can' t find power. But you can easily carry the battery with you. Many of our sample display boxes are battery-powered so that we can display samples to our customers anytime, anywhere.

How to choose a battery for LED strip lights?

Choosing a battery for an LED strip is very simple. You must focus on the output voltage, power capacity, and connection.

Voltage selection

Most LED strips work on 12V or 24V. You need to ensure that your battery's output voltage cannot exceed the working voltage of the LED strip. Otherwise, it will permanently damage the LED strip. The output voltage of a single battery may not reach 12V or 24V, and you can connect multiple batteries in series to get the voltage required by the LED strip.

For example, for a 12V LED strip, you need 8 pcs 1.5V AA batteries connected in series (1.5V * 8 = 12V). And for 24V LED strips, you can connect 2 pcs 12V batteries in series, because 12V * 2 = 24V.

Calculating power capacity



Battery capacity is usually measured in milliamp hours, abbreviated as mAh, or watt-hours, abbreviated as Wh. This value indicates the hours the battery can deliver a specific amount of current (mA) or power (W) before it runs out of charge.

You may have a question, how to calculate how long a fully charged battery can be used to light up an LED strip?

First, you need to know the total power of the LED strip. You can quickly learn from the label of the LED strip that the power of one meter of LED strip, the total power is the power of 1 meter multiplied by the total length. Then divide the total power by the voltage to get the total current A. Then you multiply A by 1000 to convert it to mA.

You can find the mAh value on the battery. Below are the mAh values of some standard batteries.
AA Dry Cell: 400-900 mAh
AA Alkaline: 1700-2850 mAh
9V Alkaline: 550 mAh
Standard car battery: 45,000 mAh

Finally, you divide the battery's mAh value by the LED strip's mA value. The result is the expected operating hours of the battery.

Connecting the battery

Another thing is you need to make sure your battery and LED strip connectors are compatible. A battery pack has open wires or DC connectors as its output terminals. LED strips generally have open wires or DC connectors.

What batteries can be used to power LED strip lights?

There are a variety of batteries that can be used to power LED strips, each with a specific role. Common batteries generally include Coin cells, alkalines, and lithium batteries.

Coin cell battery



A coin cell battery is a small, cylindrical battery often used in small electronic devices such as watches and calculators. These batteries are also known as button cells or watch batteries. Coin cell batteries get their name from their size and shape, similar to a coin.

Coin cell batteries are made up of two electrodes, a positive electrode (cathode) and a negative electrode (anode), separated by an electrolyte. When the battery is used, the cathode and anode react with the electrolyte to create an electrical current. The amount of electrical current a coin cell battery can produce is determined by its size.

Coin cell batteries are typically made of lithium or zinc-carbon, although other materials such as silver-oxide or mercury-oxide can also be used.

Coin cells can only supply 3 volts at 220mAh, enough to light one to a few LEDs for a few hours.

1.5V AA/AAA Alkaline battery



1.5V AA AAA Alkaline batteries are common in many electronic devices.

These batteries are often used in flashlights, remote controls, and other small electronics. Alkaline batteries have a longer shelf life than other types of batteries, making them a good choice for devices that are not used frequently.

Due to its small size, the capacity of the AAA battery is only 1000mAh. However, the capacity of AA batteries can be as high as 2400mAh.

Battery box



A battery case is an excellent option if you need to connect multiple AA/AAA batteries. Multiple batteries can be installed in one battery box, connected in series.

3.7V rechargeable battery



A 3.7V rechargeable battery is a battery that can be recharged and used multiple times. It is made up of two or more cells that are connected in series or parallel.

9V Alkaline Battery



A 9V alkaline battery is a battery that uses an alkaline electrolyte to produce a voltage of 9 volts. The alkaline electrolyte is a mixture of potassium hydroxide and sodium hydroxide, both highly corrosive.

9V alkaline batteries are also known for their long shelf life; they can last up to 10 years when stored properly. If you need a reliable and long-lasting battery for your devices, then a 9V alkaline battery is perfect. It can have a nominal capacity of 500 mAh.

12V rechargeable Lithium battery



A 12V rechargeable Lithium battery is a type of battery that can be used in a variety of electronic devices. It comprises lithium ions, electrically charged particles that can store and release energy.

The advantage of using a 12V rechargeable Lithium battery over other types of batteries is that it has a higher energy density. This means it can store more energy per unit of weight than other batteries. This makes it ideal for use in portable electronic devices where weight is a concern. It can have a nominal capacity of 20,000 mAh.

How long can the battery power the led strip light?

If you want to know how long a fully charged battery can be used to power an LED strip, you need to know two things: battery capacity and power consumption of the LED strip.

Battery capacity

Generally, the battery's capacity will be marked on the surface of the battery.

Here, I take a lithium 12V battery at 2500mAh as an example.

Power consumption of the LED strip

You can easily know the power per meter of the LED strip through the label.

The total power of the LED strip can be multiplied by the power of 1 meter by the total length in meters.

Here is an example of a 12V, 6W/m LED strip with a length of 2 meters.

So total power consumption is 12W.

Calculation

First, you divide the total power of the strip by the voltage to get the current in A.

Then convert the current A to mA by multiplying by 1000. That is the current of the LED strip is 12W/12V*1000=1000mA.

Then we divide the capacity of the battery by the total current of the light bar to get the operating time of the battery in hours. That is 2500mAh / 1000mA = 2.5h.

So the working time of the battery is 2.5 hours.

How to extend battery life?

Due to the small capacity of the battery, it can generally only work for a few hours. After the battery runs out of power, you can either better the battery or recharge it. But you can extend the life of your battery by following a few simple methods.

Add a switch

You can add a switch to cut off the power when you don’t need the lighting. This saves energy and extends battery life.

Add a dimmer

The brightness of your lighting doesn’t need to be constant all the time. Sometimes reducing the brightness of the lighting in certain scenes can save power and extend battery life. You can add a dimmer to the battery and LED strip to adjust the brightness of the LED strip.

Reduce LED strips

The longer the LED strips you use, the shorter the battery life. So, please re-evaluate. Do you really need such a long LED strip? A choice must be made between the LED strip’s length and the battery’s life.

How to connect the led strip light to the battery?

It is a simple process that anyone can do.

Step 1: First, find the positive and negative terminals on the battery.

The positive terminal will have a plus sign (+) next to it, while the negative terminal will have a minus sign (-) next to it.

Step 2: Locate the corresponding terminals on the led strip light. The positive terminal on the led strip light will be marked with a plus sign (+), while the negative terminal will be marked with a minus sign (-).

Step 3: Once you have located the correct terminals, connect the positive terminal of the battery to the positive terminal of the led strip light, and

then connect the negative terminal of the battery to the negative terminal of the led strip light.

How to power RGB strip light with battery?



You will need the following items: RGB light bar, battery, and controller.

Step 1: Connect the controller and battery.

First, you need to connect the controller’s positive terminal to the battery’s positive terminal.

Next, you connect the controller’ s negative terminal to the battery’ s negative terminal.

Step 2: Connect the RGB LED strip to the controller.

You can clearly see the markings on the controller: V+, R, G, B. Just connect the corresponding RGB wires to these terminals.

Can I use a battery to power my sensor cabinet light?

Yes, you can, as long as you ensure the voltage of the battery is compatible with the voltage of the LED strip.

If you plan to use the battery to light the sensor cabinet light frequently, the best option is to use a rechargeable battery. This way, you won’ t have to change the battery and need to charge it.

Can I power a 12V LED strip with a 9V battery?

Yes, you can. The 12V LED strip can work at a lower voltage than it requires, but the brightness will be lower.

The LEDs work at 3V, and the LED strips use PCBs to connect multiple LEDs in series. For example, a 12V LED strip is 3 LEDs connected in series, with a resistor to dissipate the extra voltage (3V).

It is safe to light a 12V LED strip with a 9V battery. However, it should be noted that if the voltage of the battery is higher than that of the LED strip, it will permanently damage the LED strip.

Can I connect a 12V LED strip to a car battery?



Your car's battery has a voltage of 12.6 volts or higher when fully charged. If your engine is running, its voltage will rise to 13.7 to 14.7 volts, dropping to 11 volts whenever battery drain occurs. Due to the lack of stability, it is never a good idea to power the 12V LED strip directly from the car battery. Doing so can cause the strips to overheat and shorten their life.

Instead of connecting them directly, you need a voltage regulator. Because you need exactly 12V to run your LED strips, using a regulator will drop your 14V battery to 12, making your LED strips safer. However, there is a pro

blem. Whenever your car’ s battery voltage drops, the brightness of your LEDs will and may drop.

Will LED strip lights drain my car’ s battery?

Your car’ s battery has enough capacity to power a typical car light strip for more than 50 hours before it runs out.
Many factors can accelerate capacity loss, such as a high number of LEDs or the use of high-powered LEDs. But.
Usually, even if you leave it overnight, it’ s unlikely to drain your car’ s battery.

Are battery powered LED strips safe?

LED strip lights are safe if you install and use them correctly, whether it is LED power supply or battery power.
Be careful, do not use higher voltage to power the LED strip, which will damage the LED strip and even cause a fire.

Precautions for using a battery

Like other electronic devices, you need to be careful with batteries. Do not use a battery with a higher voltage than the LED strip to power the LED strip. This will damage the LED strip and may also cause a fire.
When charging a rechargeable battery, do not charge it with a voltage higher than its proper voltage, as it may cause the battery to overheat, swell, and cause a fire.

Can I power LED lights with a power bank?

Yes, you can power LED lights with a power bank. But you need to ensure that the voltage of the power bank is compatible with the voltage of the LED strip.

What batteries are best for LED lights?

The best battery for LED lights is Lithium Ion Polymer Battery. This battery has a high energy density which means it stores more power per unit volume. Also, these batteries last longer than other types of batteries.

The Ultimate Guide To CSP LED Strip

In the rapidly evolving world of LED lighting, the CSP LED strip has emerged as a leading choice for both residential and commercial applications. This comprehensive guide to CSP LED strips will provide you with an in-depth understanding of their advantages, features, and applications, helping you make an informed decision when selecting the perfect lighting solution for your needs. Join us as we explore the world of CSP LED strips and discover how they can transform your lighting experience.

Introduction

What is a CSP LED strip?

A CSP LED strip is a type of flexible lighting solution that utilizes Chip Scale Package (CSP) LEDs, which are compact and highly efficient light-emitting diodes. These LEDs are attached to a flexible Printed Circuit Board (PCB) and covered with a translucent, milky-white silicone coating. The small size and integrated design of CSP LEDs result in lower thermal resistance, fewer heat transfer paths, and greater reliability compared to traditional LED packages. With their excellent performance, CSP LED strips are increasingly being used for various lighting applications, including residential, commercial, and architectural projects.



csp led strip

The benefits of using CSP LED strips

CSP LED strips offer a range of benefits that make them an attractive choice for various lighting applications. Some of these advantages include:

High Luminous Efficiency

CSP LEDs boast higher light output and energy efficiency compared to traditional LED packages. Their translucent silicone coating ensures better light transmittance, resulting in brighter illumination.

Better Color Consistency

CSP LED strips have superior color consistency due to their precise binning process, which ensures uniform color temperature and reduced color variation across the strip. For more detail information, you can check [What Is LED Binning?]

Compact Size and Flexibility

The small size of CSP LEDs allows for high-density LED arrangement on the strip, enabling a sleeker and more compact design. This makes CSP LED strips ideal for use in tight spaces or intricate lighting installations.

Enhanced Reliability

CSP LEDs do not require solder gold wire connections, which reduces the number of potential failure points. This leads to improved durability and longer lifespan for the LED strip.

Easy Installation

CSP LED strips can be cut to length and easily installed in a variety of settings, making them a versatile and user-friendly lighting solution.

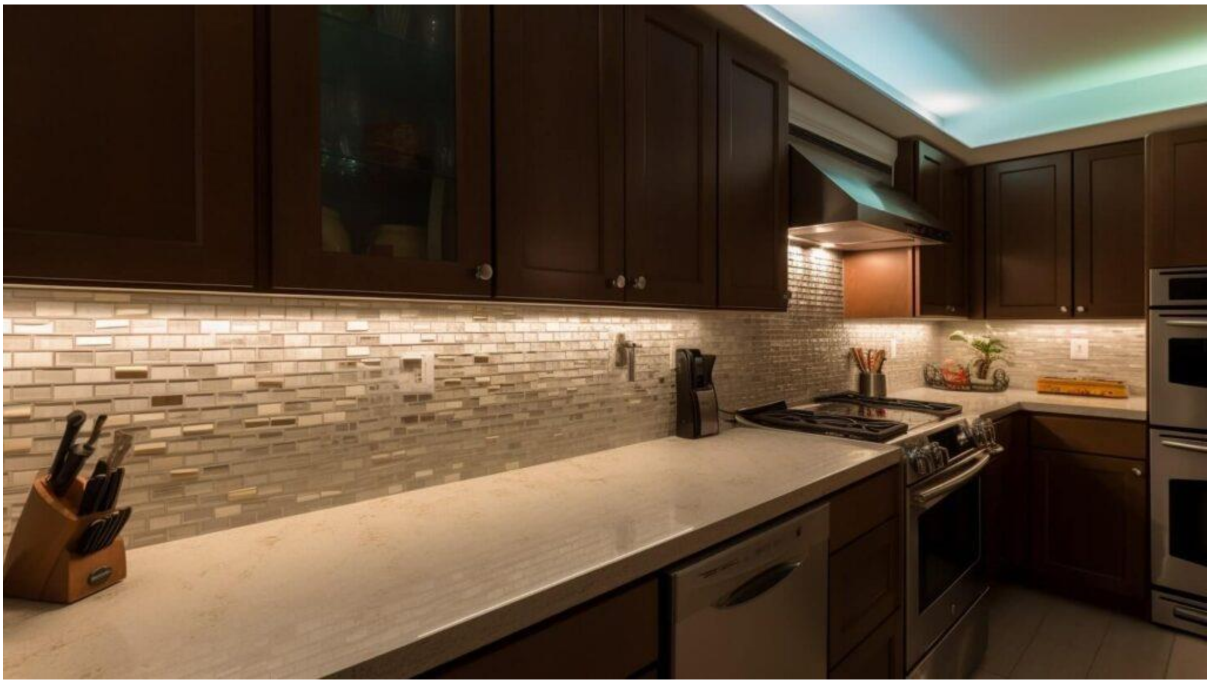
Wide Applicability

Due to their excellent performance characteristics, CSP LED strips can be used in a range of applications, including residential, commercial, and architectural lighting projects, as well as for accent, task, or ambient lighting purposes.

In summary, CSP LED strips offer numerous benefits, such as high luminous efficiency, better color consistency, compact design, enhanced reliability, and versatility, making them a popular choice for modern lighting solutions.

Applications of CSP LED strips

Residential Lighting

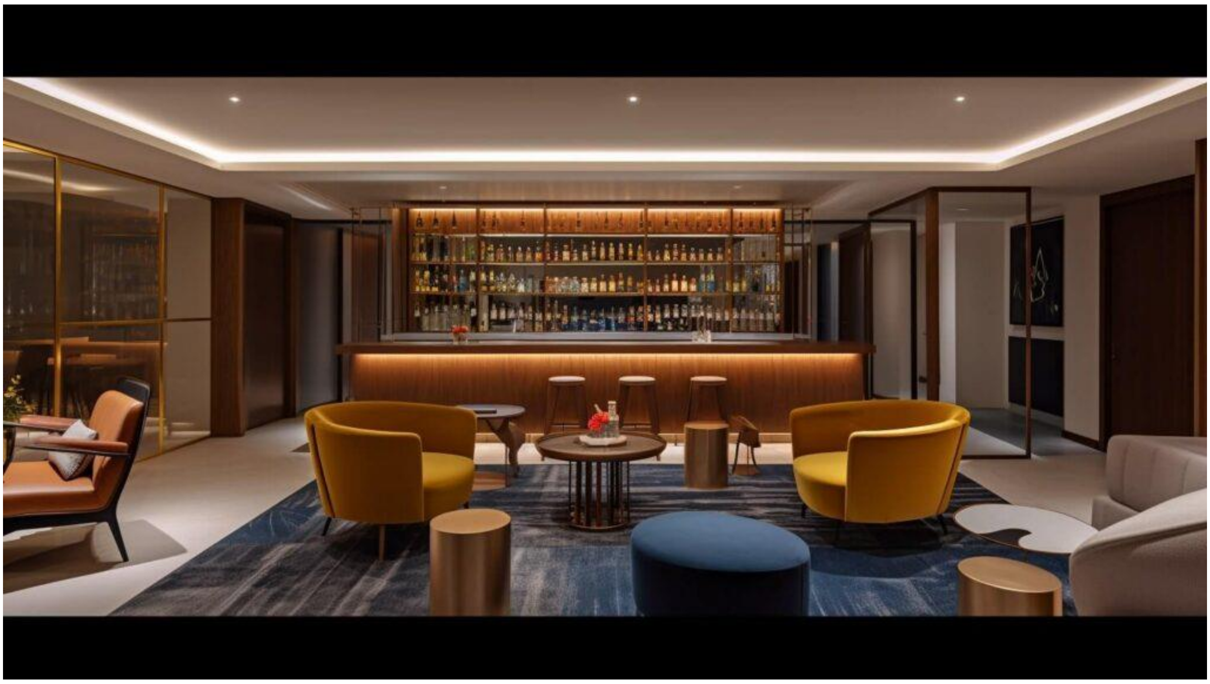


Under-cabinet lighting in kitchens and bathrooms: CSP LED strips provide bright, focused illumination for countertops and workspaces, enhancing visibility and safety. For more information, you can read How To Choose the LED Strip Lights For Kitchen Cabinets?

Cove lighting and accent lighting in living rooms and bedrooms: Adding a warm, ambient glow to create a cozy and inviting atmosphere. For more information, you can read Cove Lighting: The Definitive Guide.

Staircase and hallway illumination: Ensuring safe navigation while adding a stylish touch to your home’ s interior design. For more information, you can read 16 Stair Lighting Ideas With LED Strip Lights.

Commercial Lighting



Display case and shelf lighting in retail stores: Showcasing products with vibrant, uniform illumination to attract customers and boost sales.

Task lighting in offices and workshops: Improving productivity by providing efficient and comfortable lighting for workspaces.

Architectural lighting for hotels, restaurants, and bars: Enhancing the ambiance and visual appeal of commercial spaces to create memorable experiences for guests.

Outdoor and Landscape Lighting



Pathway and step lighting: Guiding visitors safely through outdoor spaces while adding visual interest and curb appeal.

Patio, deck, and poolside illumination: Creating a relaxing and enjoyable atmosphere for outdoor gatherings and entertainment.

Garden and landscape feature lighting: Highlighting the beauty of your green spaces and showcasing the intricate details of landscape designs.

Signage and Advertising



Illuminated signs and billboards: Increasing visibility and drawing attention to your brand or message.

Logo and branding backlighting: Enhancing the impact of corporate identities and promotional materials.

Exhibition and trade show displays: Ensuring your products and services stand out in crowded event spaces.

Automotive and Marine Lighting



Interior and exterior vehicle lighting: Improving safety and visibility on the road while adding a touch of personal style to your vehicle.

Accent and decorative lighting for boats and yachts: Enhancing the aestheti c appeal and functionality of marine vessels for a luxurious experience on the water.

Entertainment and Stage Lighting



Theater, concert, and event lighting: Captivating audiences with dynamic and engaging visual effects.

Special effects and mood lighting in clubs and entertainment venues: Creating immersive and memorable experiences for patrons and partygoers.

CSP LED strips are versatile and adaptable, making them suitable for a wide range of applications in various settings. Their high efficiency, reliability, and color consistency make them an ideal choice for both professional and personal use.

Understanding CSP LED Technology

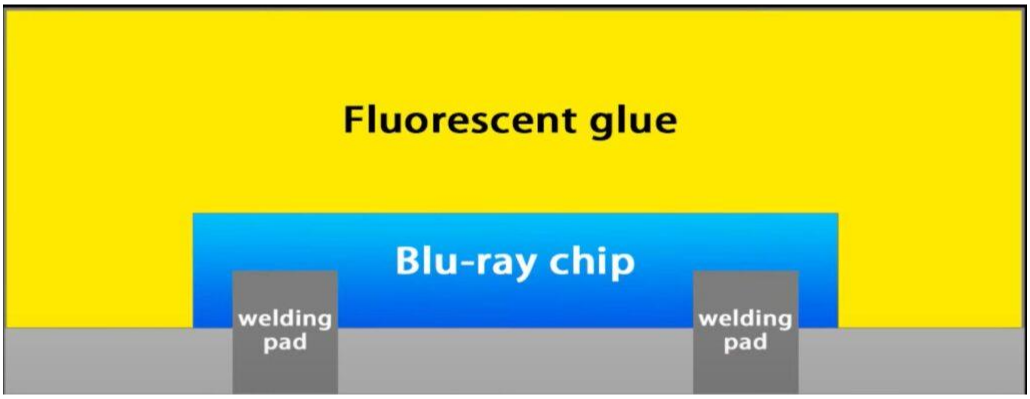
CSP, or Chip Scale Package, is an advanced packaging technology that has had a significant impact on the LED industry. In the following content, we will explore how CSP technology enhances LED strips and compare CSP LED strips to other LED technologies.

Chip Scale Package (CSP) explained

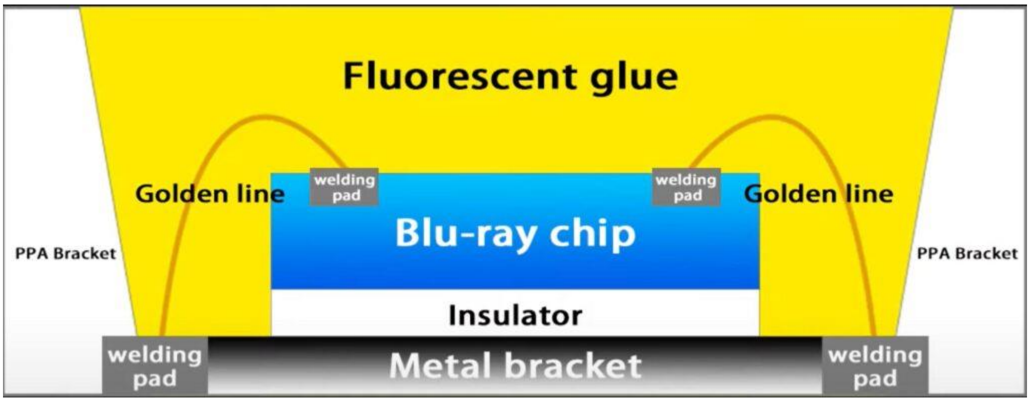
Chip Scale Package (CSP) is an advanced packaging technology in the field of integrated circuits and LED manufacturing. Developed in 1994 by Japan's Mitsubishi Corporation, CSP has since become a popular choice for many electronic applications due to its numerous advantages.

CSP technology refers to a packaging process where the size of the package is no more than 20% larger than the size of the semiconductor chip itself. This compact packaging design allows for greater integration and miniaturization, resulting in smaller, lighter, and more efficient electronic devices.

In the LED industry, CSP technology involves the use of gold-free wire flip-chip processes. In this approach, the blue LED chip is directly bonded to the PCB board through the pole pad. The LED is then coated with fluorescent glue on the chip’s surface. This eliminates the need for traditional wire bonding and brackets, which are common in Surface Mounted Device (SMD) LED packages.



csp led



smd led

How CSP technology enhances LED strips

CSP technology offers numerous benefits for LED strips. These advantages include:

Higher luminous efficiency: Due to the compact packaging design and fewer heat transfer paths, CSP LED strips provide higher light output per watt.

Improved color consistency: CSP LED strips can achieve 3-step Macadam color tolerance, ensuring better color uniformity across the strip.

Enhanced reliability: CSP LEDs eliminate the need for solder wire connections, resulting in fewer possible points of failure.

Compact design: The small size of CSP LEDs allows for higher LED density, enabling more flexible and versatile lighting applications.

Comparing CSP LED strips to other LED technologies

When it comes to LED strips, there are several technologies to choose from. Two popular alternatives to CSP LED strips are COB (Chip on Board) LED strips and SMD (Surface Mounted Device) LED strips. Each of these technologies has its own set of advantages and disadvantages, and understanding their differences can help you make an informed decision for your lighting needs.

CSP LED Strip VS COB LED Strip

CSP and COB LED strips both provide high-quality lighting solutions but differ in certain aspects. CSP LED strips offer better color consistency and higher light efficiency due to their compact packaging design, while COB LED strips excel in light uniformity. In most cases, the choice between CSP and COB LED strips will depend on the specific requirements of your lighting project. For more information, you can read CSP LED Strip VS COB LED Strip.

Feature	CSP LED Strip	COB LED Strip
Appearance	Translucent milky white glue	Yellow glue mixed with phosphor
Color Tolerance	3-step Macadam	5-step Macadam
Light Efficiency	Higher light efficiency	Lower light efficiency
Light Uniformity	Less uniform, may show light spots	More uniform, no light spot effect

Light Color	No yellow light on the edge, soft light	Yellow light on the edge
Beam Angle	180 degree	180 degree

CSP LED Strip VS SMD LED Strip

CSP and [SMD LED strips]() are both popular choices for various applications, but they differ in terms of size, heat dissipation, color consistency, and application flexibility. CSP LED strips, with their compact design and improved heat dissipation, are more versatile and provide better color consistency than SMD LED strips. However, SMD LED strips have been a reliable choice for many years and continue to be used in a wide range of lighting applications. Ultimately, the decision between CSP and SMD LED strips will depend on the specific requirements and constraints of your project.

Attribute	CSP LED Strip	SMD LED Strip
Size	Smaller, more compact	Larger, less compact
Heat Dissipation	Better heat dissipation	Inferior heat dissipation
Color Consistency	3-step Macadam	3-step Macadam
Light Uniformity	High density, less hot spot	Lower density, more hot spot
Application Flexibility	More versatile and flexible	Less versatile and flexible
Beam Angle	180 degree	120 degree

In conclusion, CSP LED strips offer a range of advantages over other LED technologies, including higher light efficiency, better color consistency, and improved reliability. These features make them an excellent choice for va

rious lighting applications, from residential to commercial and industrial settings.

Types of CSP LED Strips

CSP LED strips come in various types, catering to different lighting needs and applications. Let's explore the different types of CSP LED strips available in the market.

Single Color CSP LED Strips

Single color CSP LED strips emit a single, fixed color, such as warm white, cool white, or any other solid color like red, green, or blue. These strips are perfect for creating a specific ambiance or for accent lighting. Due to their simplicity, single color CSP LED strips are an affordable and popular choice for various residential and commercial applications.

Tunable White CSP LED Strips

Tunable white CSP LED strips allow users to adjust the color temperature of the white light emitted by the strip. With these strips, you can change the color temperature from warm white to cool white or any shade in between. Tunable white LED strips are ideal for creating dynamic lighting environments that can be adjusted to suit a specific mood or purpose, such as task lighting or relaxation.

RGB, RGBW and RGBTW CSP LED Strips

RGB CSP LED strips feature red, green, and blue LEDs, which can be mixed to create a wide range of colors. RGBW CSP LED strips add a dedicated white LED, allowing for even more color options and better white light performance. These LED strips are perfect for decorative lighting, mood lighting, or creating a dynamic lighting experience in any space.

Addressable CSP LED Strips

Addressable CSP LED strips, also known as digital LED strips or pixel LED strips, allow for individual control of each LED on the strip. This enables the creation of intricate color patterns, animations, and effects. Addressa

ble CSP LED strips are perfect for interactive installations, stage lighting, and other creative applications that require precise control and customization.

High-density CSP LED Strips

High-density CSP LED strips pack more LEDs per meter or foot than standard LED strips, resulting in a more uniform light output and fewer visible light spots. These strips are ideal for applications where a smooth, continuous line of light is required, such as under-cabinet lighting, cove lighting, or backlighting of translucent surfaces. High-density CSP LED strips often come with improved heat dissipation and higher light output, making them suitable for more demanding installations.

Key Features and Specifications

When selecting a CSP LED strip, it's important to consider several key features and specifications that can greatly impact the performance, quality, and longevity of the product. Here are some crucial factors to keep in mind:

Luminous efficacy

Luminous efficacy refers to the amount of light (lumens) emitted per unit of electrical power (watts) consumed. A higher luminous efficacy means the LED strip is more energy-efficient and produces more light with less power. When comparing CSP LED strips, choose one with a higher luminous efficacy to ensure you're getting the most light output for your energy consumption.

Color Rendering Index (CRI)

The Color Rendering Index (CRI) is a scale from 0 to 100 that measures how accurately an LED light source renders colors compared to natural daylight. A higher CRI value indicates better color rendering, which is essential for applications where accurate color representation is crucial, such as in art galleries, retail displays, or photography studios. Look for CSP LED strips with a CRI value of at least 80 for general use, and 90 or higher for applications that require exceptional color accuracy.

Ingress Protection (IP) ratings

Ingress Protection (IP) ratings are a standardized system that classifies the level of protection an LED strip has against dust and water intrusion. The IP rating consists of two digits: the first digit indicates the level of protection against solids (e.g., dust), and the second digit indicates the level of protection against liquids (e.g., water). For example, an IP65-rated LED strip is dust-tight and can withstand low-pressure water jets. Choose a CSP LED strip with an appropriate IP rating based on the intended installation environment and exposure to dust or moisture.

Lifetime and reliability

The lifetime and reliability of a CSP LED strip are essential factors to consider, as they can impact the overall cost of ownership and maintenance. LED strips with longer lifetimes and better reliability are more cost-effective in the long run, as they require less frequent replacement or maintenance. To ensure you're getting a high-quality CSP LED strip, look for products that have undergone rigorous testing, including thermal shock, distortion, and temperature cycling tests. Additionally, consider the manufacturer's warranty and support to ensure you're covered in case of any issues with the product.

Choosing the Right CSP LED Strip

Selecting the perfect CSP LED strip for your project can be a complex task, given the wide range of options available. To make the right choice, consider the following factors:

Understanding your lighting requirements

Before selecting a CSP LED strip, it's essential to understand your lighting requirements. Consider factors such as the desired brightness, color temperature, color rendering, and beam angle. Also, evaluate the installation environment, including potential exposure to dust, moisture, and extreme temperatures, as these factors can impact the LED strip's performance and durability.

Selecting the appropriate strip type

Based on your lighting requirements, choose the appropriate CSP LED strip type that best suits your needs. Here are some options:

Single Color CSP LED Strips: Ideal for creating a consistent, monochromatic ambiance.

Tunable White CSP LED Strips: Offer adjustable color temperatures for customizing the lighting to match different moods or tasks.

RGB and RGBW CSP LED Strips: Allow for dynamic color changing and mixing, perfect for creating vibrant and colorful lighting effects.

Addressable CSP LED Strips: Provide individual control over each LED for creating complex lighting patterns, animations, or effects.

High-density CSP LED Strips: Feature closely-packed LEDs for a smoother, more uniform light output with minimal spotting.

Considering power and voltage options

When selecting a CSP LED strip, consider the power and voltage requirements of your project. Most LED strips are available in 12V or 24V options, with the latter being more energy-efficient and better suited for longer runs without significant voltage drop. It’s essential to use the appropriate power supply and ensure it can handle the total wattage required by the LED strip. Additionally, consider any power-related safety precautions, such as using proper cables, connectors, and drivers, to ensure a safe and reliable installation.

Installation and Mounting

Installing CSP LED strips can be a relatively simple process if you follow the right steps and have the appropriate tools and materials at hand. Below, we outline the essential aspects of the installation process.

Tools and materials needed

Before starting the installation, gather all the necessary tools and materials, including:

1. CSP LED strip of your choice
2. Compatible power supply or LED driver
3. Mounting clips or adhesive backing (depending on the strip type)
4. Connectors or soldering equipment (if required)
5. Wire strippers and electrical tape
6. Measuring tape and a pencil or marker

Preparing the installation area

First, measure the installation area and ensure the surface is clean, dry, and free from debris or dust. This step is crucial, as a clean surface allows for better adhesion of the LED strip and ensures a secure installation.

Installing and securing the strip

Depending on the type of CSP LED strip you've chosen, there are different methods to secure the strip:

For adhesive-backed strips, peel off the backing and press the strip firmly onto the surface along your desired path. Apply even pressure to ensure a strong bond.

For strips without adhesive backing, use mounting clips or brackets to secure the strip at regular intervals. Attach the clips to the surface first and then snap the LED strip into place.

Ensure the strip is installed straight and without any twisting or kinking.

Connecting the power supply

Once the LED strip is securely installed, connect it to the appropriate power supply or LED driver. This process may involve using connectors, soldering wires, or connecting the strip directly to a compatible power supply. Be sure to follow the manufacturer's instructions for your specific CSP LED strip and power supply. After making all the necessary connections, test the

LED strip to ensure it functions correctly and provides the desired lighting effect.

Powering Your CSP LED Strips

CSP LED strips require an appropriate power supply to function correctly and efficiently. Choosing the right power supply, calculating power requirements, and ensuring safe power distribution are essential steps in the installation process.

Power supply options

CSP LED strips typically require a compatible power supply or LED driver to convert the incoming AC voltage to the DC voltage needed by the strip. There are several power supply options available, including:

Plug-in power adapters: These are simple and easy to use, plugging directly into a wall outlet and providing the necessary DC voltage for your LED strip.

Hardwired LED drivers: These require a more involved installation process, as they need to be wired directly to your home's electrical system. Hardwired drivers often offer more stability and are better suited for larger installations or commercial applications.

Dimmable LED drivers: These allow you to control the brightness of your CSP LED strip by connecting the driver to a compatible dimmer switch.

Always select a power supply with an appropriate wattage rating and voltage output that matches your CSP LED strip requirements.

Calculating power requirements

To calculate the power requirements of your CSP LED strip, follow these steps:

1. Determine the wattage per meter of the LED strip (usually provided by the manufacturer).
2. Measure the total length of the strip you plan to install.

3. Multiply the wattage per meter by the total length to find the total wattage required.
4. Add an additional 20% to the total wattage to account for any power fluctuations or losses.
5. Choose a power supply with a wattage rating that meets or exceeds the calculated power requirements to ensure safe and efficient operation.

Ensuring safe power distribution

To guarantee the safe distribution of power to your CSP LED strip, follow these guidelines:

1. Use appropriately sized wires and connectors for the LED strip and power supply.
2. Do not overload the power supply by connecting too many LED strips or using a power supply with an insufficient wattage rating.
3. Install a suitable fuse or circuit breaker to protect the LED strip and power supply from potential electrical overloads or short circuits.
4. Follow all local electrical codes and safety regulations during the installation process.

If you are unsure about any aspect of the installation, consult a licensed electrician for assistance.

Controlling CSP LED Strips

There are various options for controlling your CSP LED strips, ranging from simple wired controllers to more advanced wireless and smart home integrations. Understanding the different control methods can help you choose the best solution for your specific needs and preferences.

Wired controllers

Wired controllers connect directly to the LED strip and power supply, offering a straightforward and reliable method for controlling the lighting. There are various types of wired controllers available, including:

On/off switches: These basic controllers allow you to turn the LED strip on and off with a simple switch.

Dimmer switches: These enable you to adjust the brightness of your LED strip, creating the desired ambiance in your space.

Color temperature controllers: For tunable white CSP LED strips, these controllers let you change the color temperature of the light, allowing you to switch between warm and cool white light.

RGB/RGBW controllers: These allow you to change the color and create dynamic lighting effects with your RGB or RGBW CSP LED strips.

Wireless controllers

Wireless controllers offer greater flexibility and convenience by allowing you to control your CSP LED strips without the need for physical connections. Some popular wireless control options include:

Infrared (IR) or radio frequency (RF) remote controls: These remotes use either infrared or radio signals to communicate with a compatible receiver connected to the LED strip, allowing you to control the lighting from a distance.

Wi-Fi or Bluetooth controllers: These devices connect to your home’s Wi-Fi network or directly to your smartphone via Bluetooth, enabling you to control your CSP LED strips using a dedicated app or web interface.

Smartphone and smart home integrations

Smartphone apps and smart home systems offer advanced control options for your CSP LED strips. By integrating your lighting with these platforms, you can enjoy benefits such as:

Voice control: Use voice commands through smart home assistants like Amazon Alexa, Google Assistant, or Apple Siri to control your CSP LED strips.

Scheduling and automation: Set schedules for your LED strips to turn on and off automatically, or create custom lighting scenes that change based on time, occupancy, or other factors.

Remote access: Control your CSP LED strips from anywhere in the world using your smartphone, providing added convenience and security.

When choosing a control method for your CSP LED strips, consider your specific needs, desired level of convenience, and compatibility with your existing smart home ecosystem.

Customizing Your Lighting Experience

Lighting plays a significant role in creating the desired ambiance in any space. With CSP LED strips, you can customize your lighting experience to suit your specific needs and preferences. This section explores the various ways you can tailor your lighting setup with CSP LED strips.

Dimming capabilities

One essential feature for customizing your lighting is dimming. Dimming allows you to adjust the brightness of your LED strips to create the perfect atmosphere for any situation, from a cozy evening at home to a well-lit workspace. Many CSP LED strips are compatible with dimmable power supplies and controllers, enabling you to fine-tune the light output to your desired level. For more detail information, you can read How to Dim LED Strip Lights.

Color temperature control

Another way to tailor your lighting experience is by adjusting the color temperature. Color temperature refers to the warmth or coolness of white light and is measured in Kelvins (K). Lower Kelvin values produce warmer, more yellow light, while higher Kelvin values yield cooler, bluer light.

Tunable white CSP LED strips allow you to change the color temperature of the light, enabling you to create the ideal mood for any setting. With a compatible controller, you can seamlessly transition between warm and cool white light, striking the perfect balance for your space. For more information, you can read Tunable White LED Strip: The Complete Guide.

Dynamic lighting effects

CSP LED strips can also provide dynamic lighting effects to enhance your environment further. RGB, RGBW, and addressable CSP LED strips offer a multit

ude of colors and effects, giving you the flexibility to create customized lighting scenes. With a compatible controller, you can program various animations, color-changing patterns, or even synchronize your lighting with music or other media.

By exploring these customization options, you can create a unique and personalized lighting experience with CSP LED strips that complements your space and caters to your specific needs.

CSP LED Strip Accessories

When working with CSP LED strips, you may require additional accessories to help with installation, customization, and maintenance. Here are some common accessories you might need:

Connectors and adapters

Connectors and adapters are essential for linking multiple LED strip segments together or joining the strip to the power supply. Some popular options include:

L-shaped connectors: These are useful for creating sharp 90-degree angles when installing LED strips around corners.

T- or X-shaped connectors: These enable you to split the power from one source to multiple LED strips or to create a more complex lighting layout.

Solderless connectors: These allow you to connect LED strip segments without the need for soldering, simplifying the installation process.

Power supply adapters: These are used to connect your LED strip to the power supply, ensuring a safe and secure connection.

Extension cables: Extension cables are helpful when you need to bridge a gap between two LED strip segments or when connecting the LED strip to a distant power supply. These cables are available in various lengths and configurations, allowing you to customize your lighting installation.

Aluminum channels and diffusers

Aluminum channels and diffusers offer both aesthetic and functional benefits for your CSP LED strip installation:

Protection: Aluminum channels can protect the LED strip from dust, debris, and physical damage, increasing its lifespan.

Heat dissipation: The metal channels help dissipate heat generated by the LED strip, improving its performance and longevity.

Improved appearance: Diffusers cover the LED strip, creating a more uniform and polished appearance by reducing visible hotspots and glare.

Troubleshooting Common Issues

Despite their many advantages, CSP LED strips may occasionally encounter issues. Here are some common problems and their potential solutions:

Flickering and inconsistent brightness

If your CSP LED strip flickers or exhibits inconsistent brightness, it may be due to:

Insufficient power: Ensure that your power supply is adequate for the total length and wattage of your LED strip.

Loose connections: Check all connections between the LED strip segments and the power supply, ensuring they are secure and properly seated.

Uneven color distribution

Uneven color distribution can occur if the LED chips are not evenly spaced or if the strip is bent improperly. To resolve this issue:

Inspect the LED strip for damage or irregularities in the chip placement.

When bending the strip, avoid sharp bends or twisting that could cause uneven illumination.

Power and connectivity problems

If your CSP LED strip is not turning on or functioning correctly, consider the following:

Power supply issues: Verify that your power supply is properly connected, functioning, and providing the correct voltage.

Damaged LED strip: Inspect the strip for damage or breaks in the circuit, and replace it if necessary.

Connectivity problems: Check all connections between the LED strip segments and the power supply to ensure they are secure and properly aligned.

By understanding these common issues and their solutions, you can help ensure that your CSP LED strip installation remains reliable and performs optimally. For more information, you can read 29 Common Problems with LED Lighting and Troubleshooting LED Strip Problems.

Safety Precautions

When working with CSP LED strips, it's essential to prioritize safety. Here are some key safety precautions to consider during installation and use:

Handling and installing CSP LED strips

Always disconnect the power supply before handling or installing the LED strip.

Wear appropriate protective gear, such as gloves and safety glasses, to prevent injuries.

Avoid touching the LED chips directly, as they may be sensitive to static electricity or oils from your skin.

Electrical safety considerations

Use a power supply with the appropriate voltage and wattage for your LED strip installation.

Inspect all cables and connections for damage or wear before installation.

Avoid overloading electrical circuits, and consult a licensed electrician if you're unsure about your electrical system's capacity.

Preventing overheating

Ensure adequate airflow and heat dissipation around the LED strip, especially in enclosed spaces or when using aluminum channels.

Do not cover the LED strip with flammable materials or insulation.

Regularly inspect the LED strip for signs of overheating, such as discoloration or warped components.

For more information, you can read LED Heat Sink: What Is It and Why It's Important?

Energy Efficiency and Environmental Impact

CSP LED strips are known for their energy efficiency and reduced environmental impact compared to traditional lighting options. Here are some factors to consider:

Power consumption

CSP LED strips consume significantly less energy than incandescent or halogen bulbs, reducing electricity costs and greenhouse gas emissions.

Opt for LED strips with a higher luminous efficacy (lumens per watt) to maximize energy efficiency.

Material composition and recyclability

CSP LED strips are typically made from environmentally friendly materials, such as copper and silicone.

Many components of LED strips, including the aluminum channels and some electronic components, can be recycled at the end of their lifespan.

Reducing your carbon footprint

Use a timer or smart controller to turn off the LED strip when not in use, conserving energy.

Consider using solar power or other renewable energy sources to power your LED strip installation, further reducing your environmental impact.

By following these safety precautions and considering the energy efficiency and environmental impact of CSP LED strips, you can create a safe, cost-effective, and eco-friendly lighting solution.



Future of CSP LED Strip Technology

The CSP LED strip market is constantly evolving, driven by advancements in technology and a growing demand for energy-efficient, versatile lighting so

lutions. Here are some trends and developments shaping the future of CSP LED strips:

Advancements in efficiency and performance

Ongoing research and development efforts are expected to result in even more energy-efficient CSP LED strips, with higher luminous efficacy and improved color rendering capabilities.

Innovations in chip design and packaging technology could lead to thinner, more flexible LED strips, expanding their potential applications.

Emerging applications and trends

As CSP LED strips continue to improve in performance and versatility, they are likely to be integrated into a wider range of applications, including automotive lighting, horticultural lighting, and wearable technology.

The demand for customizable, dynamic lighting solutions is expected to drive the development of more advanced addressable and tunable CSP LED strips.

The role of CSP LEDs in smart homes

With the growing popularity of smart home technology, CSP LED strips are expected to become increasingly integrated with home automation systems, allowing for seamless control and synchronization with other smart devices.

Voice assistants and AI-powered algorithms may enable more intuitive and responsive lighting control, adapting to users' preferences and habits over time.

Buying Guide: Top CSP LED Strip Brands

When shopping for CSP LED strips, it's essential to compare different brands to find the perfect fit for your needs. Here are some factors to consider and why LEDYi might be the right choice for you:

Comparing popular brands

Before making a purchase, it's crucial to research and compare the reputation, product offerings, and performance characteristics of various CSP LED strip manufacturers. Look for reviews and testimonials from other customers to gauge product quality and reliability. LEDYi, as an industry leader, has consistently received positive feedback from customers for its innovative products and commitment to quality.

Price and performance analysis

Evaluate the cost-effectiveness of different CSP LED strips, considering factors such as luminous efficacy, color rendering, and lifespan. While it might be tempting to choose a lower-priced option, remember that a higher upfront investment may pay off in terms of energy savings and reduced maintenance costs over time. LEDYi's products are known for their exceptional performance and long-lasting durability, making them a wise investment in the long run.

Warranty and customer support

Check the warranty terms and conditions for each brand, as well as their customer support channels and response times. Opt for brands with a solid reputation for after-sales support and assistance in case of product issues or questions. LEDYi offers comprehensive 5-years warranty coverage and excellent customer support, ensuring that you have a reliable partner to help you throughout the entire process, from purchase to installation and beyond.

By taking these factors into account and considering the benefits of choosing LEDYi, you can make an informed decision when purchasing your next CSP LED strip, ensuring a high-quality lighting solution tailored to your needs.

CSP LED Strip VS COB LED Strip

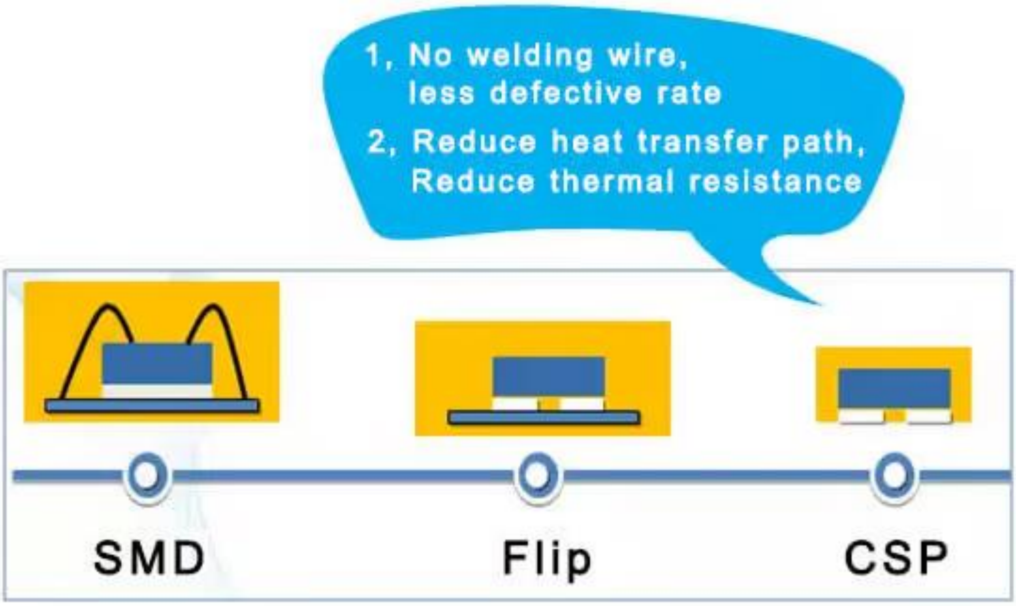
The LED strip light industry is developing rapidly, and COB LED strip lights have just appeared. Now there is a new technology, CSP LED strip. You may ask, what is a CSP LED strip? What are the advantages of CSP LED lights? I

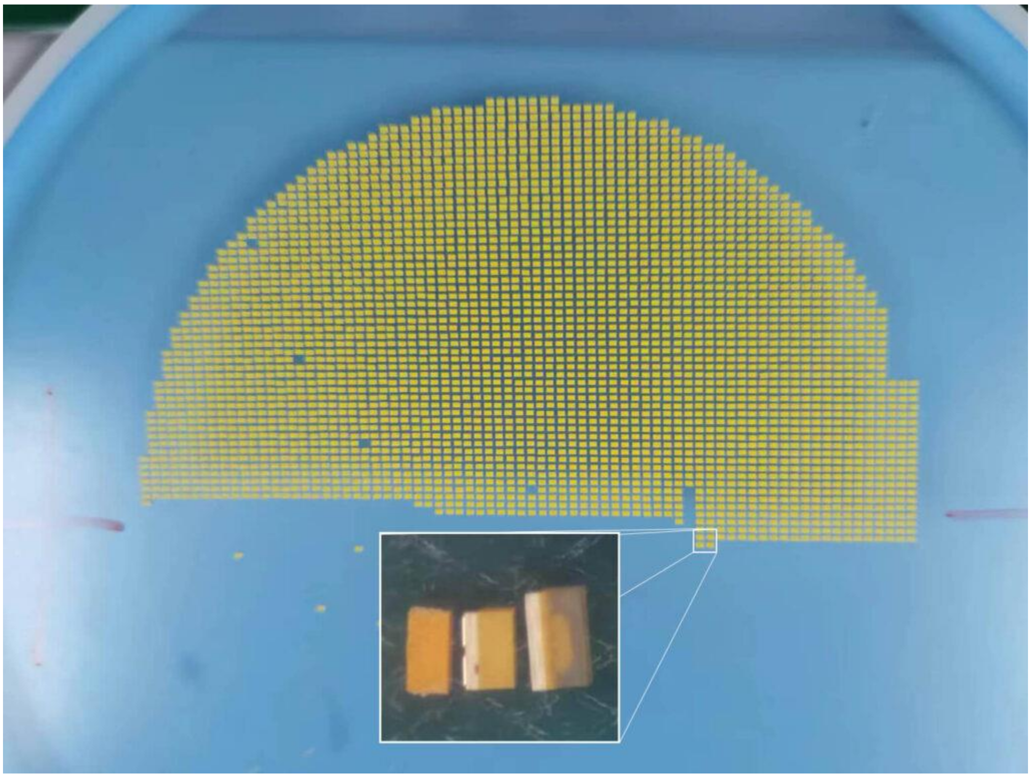
will answer these questions for you in this article. So, let’s get started.

What is CSP LED?

CSP, or Chip Scale Package, refers to an LED package that is the size of an LED chip, or no more than 20%. CSP products feature integrated components that do not require solder wire connections, resulting in lower thermal resistance, fewer heat transfer paths, and fewer possible points of failure.

CSP LEDs were initially used in mobile phone screen backlights and tablet computers and were improved by the industry and applied to flexible board light strips.





CSP LED Lamp

What is a CSP LED strip?

[CSP LED strips](#) are similar to conventional ones, except that CSP LEDs are used, attached to a flexible PCB, and covered with translucent fluorescent glue.



What is a COB LED strip?

COB stands for Chip on Board in the LED field, which means that the LED chip is packaged directly on the circuit board (PCB). “Chip on Board” LEDs for flexible strip lights are sometimes called flip-chips.

The COB led strip consists of chips encapsulated on a flexible board. The chips are primarily flip-chips, which are linearly fixed on the PCB board, and then a layer of encapsulation glue mixed with phosphor is directly dropped on the surface of the chip. The light emitted from the chip is refracted, reflected, and interacts with the phosphor, and the glue emits different colors and color temperatures of light evenly.

For more information, please read the [All you need to know before buying COB led strip].



Comparison of CSP LED strip and COB LED strip

Appearance

The glue of the COB LED strip is yellow because the glue is mixed with phosphor.

The glue of the CSP LED strip is translucent milky white, and no phosphor is mixed in the glue.

Color tolerance

CSP LED strips have better color consistency, which is the most significant advantage compared to COB LED strips.

Because CSP LED is essentially a lamp bead, the size is very small. This way, the machine can divide the CSP LED into BIN.

The chip is directly attached to the flexible PCB for COB LED strips, and then the PCB is covered with glue with phosphor powder. The white light is emitted by the blue light chip together with phosphor. There is no way for COB LED strips BINNING through the machine.

CSP LED strips can achieve 3-step Macadam color tolerance, while COB LED strips can only achieve 5-step Macadam color tolerance.

Light efficiency

CSP LED lights to come with higher luminous efficiency. Because the surface of the CSP LED strip is covered with translucent milky white glue, it has higher light transmittance.

The glue covering the chip is mixed with yellow phosphors for COB LED strips, so the light transmittance is relatively low.

Light uniformity

COB LED strip has better light uniformity.

COB LED strips are more likely to have no light spot effect with the same LED density as CSP LED strips.



CSP LED strip light on



COB LED strip light on

How to Fix Flickering LED Strip

Flickering is one of the most common problems with LED strips. By reading this article, you will learn the types of flickering, the causes of flickering, and how to fix flickering.

Let’s start.

What Are the Different Types of Flickering?

Flicker is a quick on/off cycle of a light source. It can be intentional (nightclub or concert flashing), but usually, it’s just a nuisance.

There are two types of flicker: visible and invisible. Visible flicker is anything with a frequency below 100 Hz (i.e., 100 times per second or less). Invisible flicker occurs above 100 Hz and is invisible to our eyes when it is present. Both types of flicker are unhealthy - common disorders include dizziness, eyestrain, headaches, migraines, and cognitive impairment. Visible flicker can also induce seizures in individuals with epilepsy.

What Are The Causes Of LED Strip Light Flickering?

Here are some common causes of LED strip flickers.

Visible Flicker Causes

Poor Connections

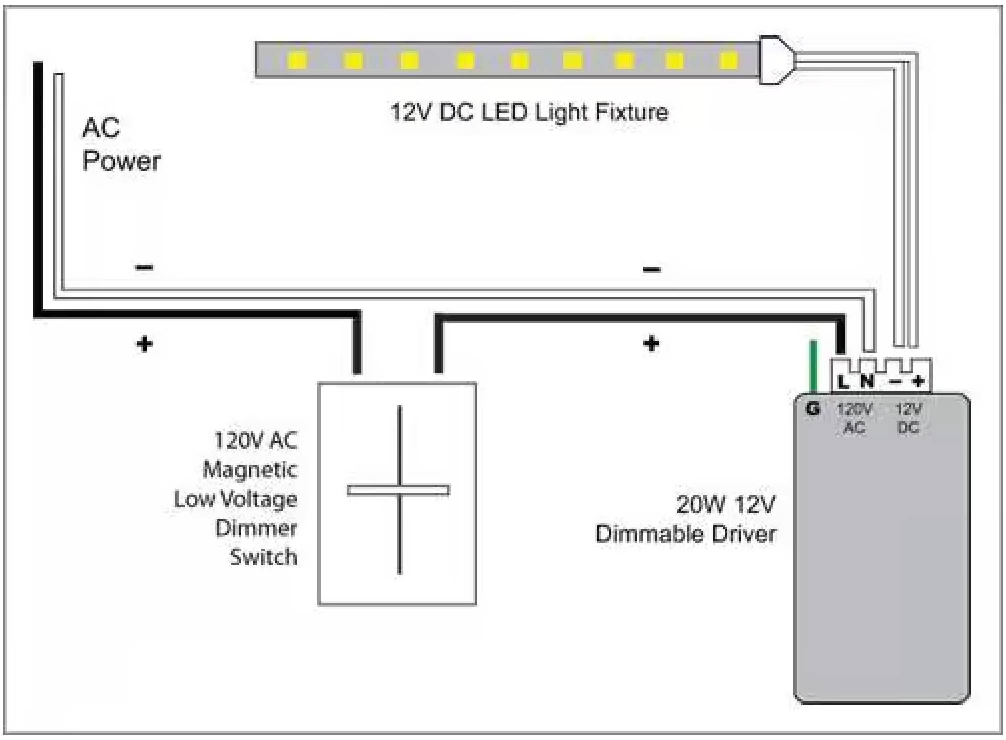
Flicker starts (or gets significantly worse) after connection. The main reason is that poor, inconsistent, or intermittent connections may cause flicker by alternately making and breaking circuits. It occurs primarily in solderless connectors and is unlikely to occur in soldering.

The LED strip flicker will change or disappear when you press the solder-free connector.



Incompatible Parts

This usually happens when the LED strip is dimmable. First, you must ensure that your LED strip and driver are supported for dimming. Then, you need to ensure that the dimmer and driver protocols are compatible. For example, you can't use a 0-10V dimmer with a DALI dimming driver.



Overloaded or Defective Power Supply

LED driver overload is one of the most common causes of LED strip flicker.

LED drivers usually have overload protection. When overloaded, the LED driver will be constantly on and off. Then the LED strip will also be constantly on and off, so it seems to be flickering.

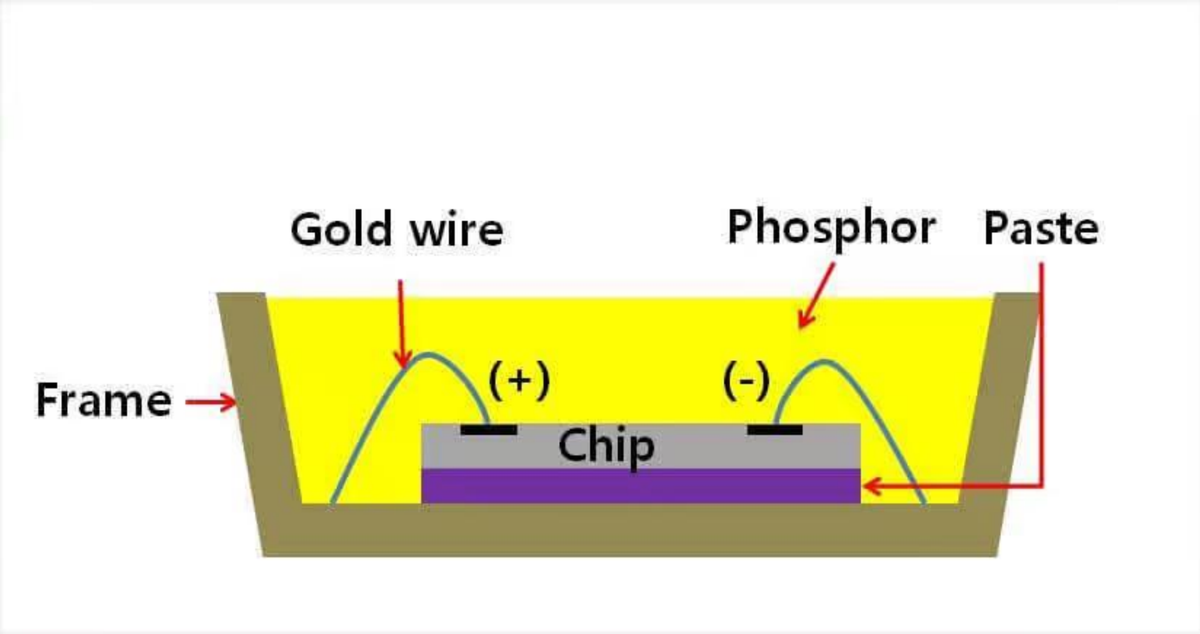
A defective LED driver can, at some times, also cause the LED strip to flicker.

Defective LED Strip

The LED strip sometimes flickers because the LED strip is defective.

In most cases, it is a bad connection between the LED chip and the holder.

In the picture below again, you can see the internal structure of the SMD LED beads. The part that emits light is the LED chip, and the LED chip is connected to the LED holder by a gold wire. When the LED chip and the bracket are not connected well, the current can sometimes pass through and sometimes not, and the LED will flicker.



Compared to SMD LEDs, CSP and COB LEDs do not have gold wires and can avoid this problem. For more information, please read the CSP LED Strip VS COB LED Strip.

There is also a situation where the LED beads and PCBs are not well soldered. When you find a specific part of the LED strip blinking, you press this part of the LED with your hand. The flicker may change or disappear.

Invisible Flicker Causes

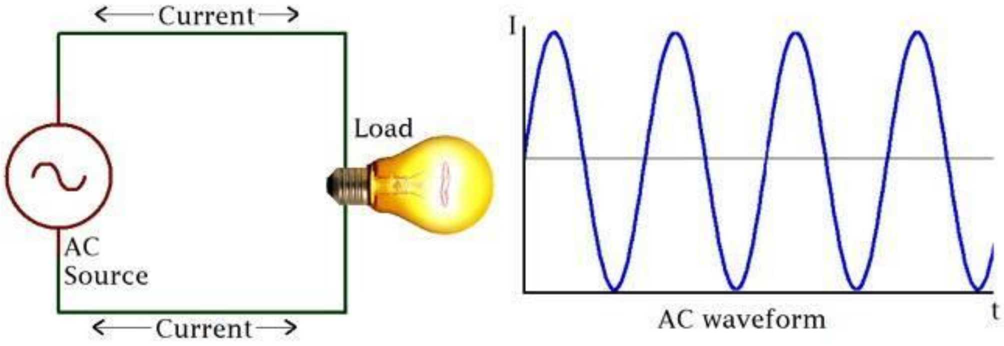
Perhaps you see some vertical lines in your smartphone's camera photos and observe some strobe in moving objects, a phenomenon caused by the invisible strobe.

AC Power LED Strip

Electric lights flicker because most of the world's electricity is transmitted via alternating current (AC). As its name implies, AC changes its direction —— flows in one direction and then turns at a rate of 50 to 60 times per second. This usually takes the form of a sine wave. However, direct current (DC) is constant and always flows in one direction.

When the current flows in the opposite direction, anything plugged into the line loses power instantly. Because the current constantly flows in the opposite direction, all the lights will flicker.

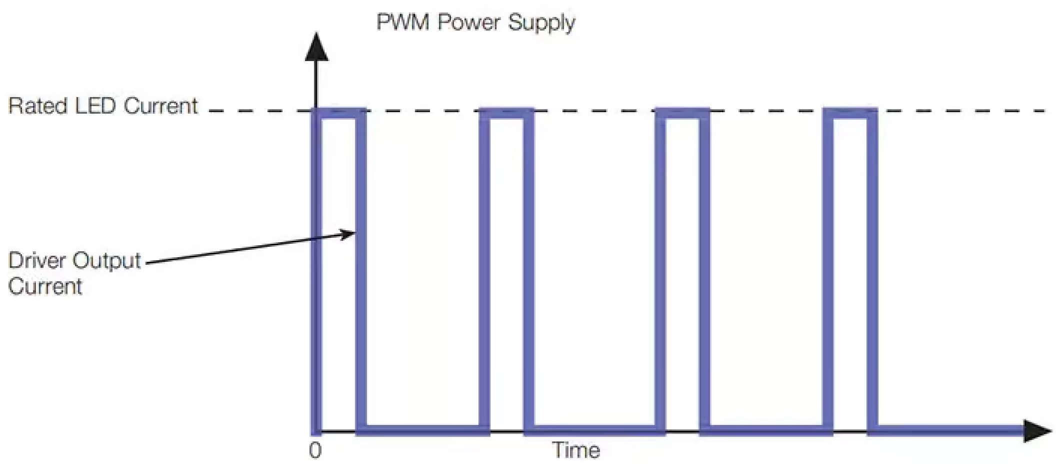
This is also the reason why the AC power LED strip is flickering.



PWM Dimming

PWM signal dimming produces invisible flickers.

PWM is the intentional manipulation of DC power between the on and off states. By varying the relative time between its on and off conditions, PWM can be used to create the perception of different brightnesses. However, the LED is either 0% or 100% bright. To achieve the illusion of 50% brightness, the LED is half the time at 0% brightness (off) and half the time at 100% brightness (on).



This flicker does not usually pose a problem because it is not visible. However, for recording video, these invisible flickers would be a disaster.

The light flickering in a video becomes more evident and apparent because the camera’ s frames per second (FPS) recording is not aligned with the frequency of electricity. This is known as the ‘strobe effect’ .

Almost all LED strip dimmers and "color changing" controllers (CCT or RGB) installed on the low voltage DC side of the circuit use PWM to achieve their desired effect. Unfortunately, many PWM dimmers use frequencies that are too low. The frequency should be 25,000 Hz or higher to eliminate the impact of PWM flicker. Still, most PWM dimmers do not include a PWM frequency specification, which usually indicates that they use a frequency of a few hundred Hz at most.
For more information about LED strip dimming, please read How to Dim LED Strip Lights.

How To Stop LED Strip Lights from Flickering?

Referring to the following suggestions, we can avoid the LED strip flicker.

Visible Flicker

Inspect the Connection

First, we need to check all the connections, including wires, connectors, and LED drivers, to ensure the connections are good. Bad connections can make too much resistance, heat up badly, and possibly cause a fire. Of course, it will also cause the LED strip to flicker.

Replace Incompatible Parts

Second, I need to replace incompatible components such as dimmers, LED drivers, etc. The most likely incompatible parts are dimmers and LED drivers.

Replace the LED Driver

Replace the faulty LED power supply, or use a higher wattage power supply.

Please note that it is impossible to use multiple LED drivers to connect a single LED strip when the LED driver's power is insufficient. Because of the inconsistent start-up time of LED drivers, the driver that starts first with insufficient power will cause overload protection, then shut down and restart again. Then all the drivers will keep starting and shutting down.

Replace Faulty LED Strips

Finally, you need to replace the faulty LED strip. When you make sure the connection is good, all parts are compatible, and the LED driver is okay, you finally have to replace the LED strip.

Invisible Flicker

Use Low Voltage DC LED Strip Lights with LED Drivers

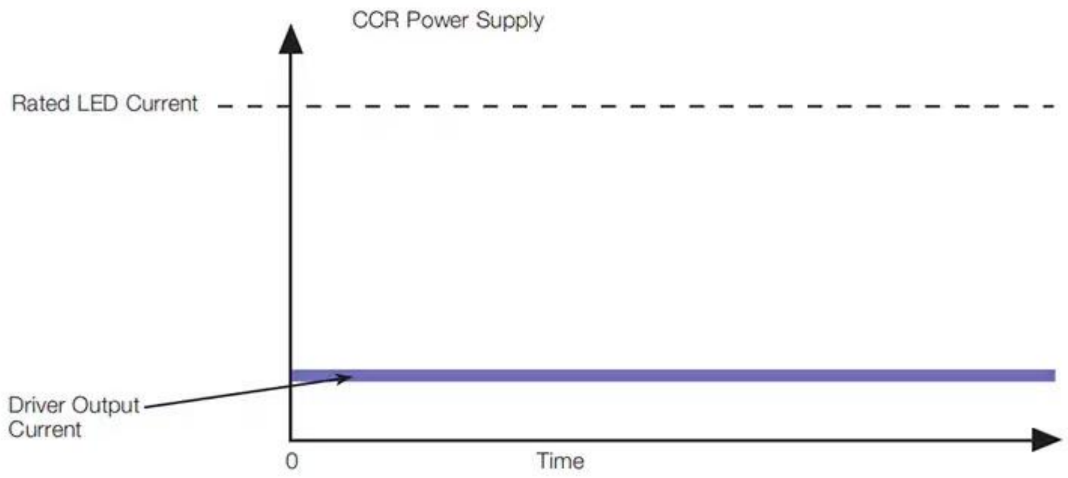
We use low-voltage LED strips and high-quality LED drivers whenever possible. LED drivers convert high-voltage AC into stable low-voltage, thus ensuring that the LED strips are flicker-free.

If you want to understand the famous LED driver brand quickly, you can read Top LED Driver Brand Manufacturer List.

Use Dimming Power Supplies with CCR Output Signal

The output dimming methods of dimming power supply are mainly divided into two types, Constant Current Reduction (CCR) and Pulse Width Modulation (PWM) (also known as Analog Dimming).

In CCR, the current flows continuously through the LED. So the LED is always ON, not like in PWM, where the LED is always turned ON and OFF. The brightness of the LED is then varied by changing the current level.



Use Dimming Power Supplies with High Frequency PWM Output Signal

In PWM, the LED is turned ON and OFF at its rated current at a high frequency. The rapid switching is high enough for the human eye to see. What deter

mines the brightness level of the LED is the duty cycle or the ratio of the time when the LED is ON and the total time of one complete cycle.

The higher the camera will see the frequency of the PWM, the less likely the flicker. Frequently more than 25 kHz, the camera cannot see the flicker.

Troubleshooting LED Strip Problems

Before a few years ago, only experts knew about LED technology. Light emitting diodes were kind of a tech underdog when technology was at its most limited. But LED products have recently started to take a bigger share of the market for lighting. Even at the consumer level, it’s easy to find a lot of models. So much so that you can now buy an LED strip light almost anywhere. Of course, every model has at least one problem that needs to be fixed.

So, here are some common problems with LED strip lighting that you can fix. Follow the steps below to find your exact problem, each problem is explained briefly and has a simple solution.

My LEDs Are Flashing

If your LEDs flash in a pattern, your power source is being used up too quickly. This means too many lighting strips are connected to that power source. For example, a 10m LED strip that uses 5W per meter would require 50W. If all of those strips are powered by a 30W source, this will go into a safety mode called “overload protection.” In this mode, the device will turn on, figure out that it is complete, and turn off again. Then this cycle will start all over again.

You might buy a more significant power supply that can handle the total wattage needed, which is bigger than the total wattage of all your LED strips. You could also split the strips between two power sources the same size as you have now. On the other hand, your project might allow you to connect fewer strips to that power supply.

For more detail information, you can read How to Fix Flickering LED Strip.

A Different Color Is Being Shown By My RGB/RGBW LEDs In a Few Small Areas Of The Strip

Do your LED strips usually work for most of their length but only in one or a few places near where they were cut? That means that the broken Red LEDs are in that part. This is easy to check because if you only set the strips to Red, that part will be completely dark, and if you only set them to Purple, that part will only show Blue.

It can be very confusing when you set up your first LED project and see that the colors don't go together. But the simple answer is that one of the RGB/W LEDs in that area is broken and needs to be replaced. This can be caused by static electricity, too much bending and twisting, stepped on, damage during shipping, using a cheap, low-quality strip, or dry solder joints.

Each segment of a flexible LED strip, which may be manufactured in a range of lengths, is hardwired to create its own independent, self-contained circuit (In other words, just the portion of the strip that is contained inside the cut points will be affected if an LED or resistor is damaged.).

This problem is probably caused by a dry solder joint and shows up when the whole part between the cut points doesn't work. It is a lot like that, a broken LED or resistor.

Most of the time, the only choice is to replace that part of the strip. To do this, the whole strip can be switched. You can buy a different part and solder it or use connector clips to add a new 100mm section. Before you do this, try touching or pressing down on the LEDs or resistors in the damaged area. In the best case, the light turns back on by itself. In this case, a dry solder joint is an issue you can fix if you know how to solder.

My RGBW And RGB LEDs Are Displayed In Different Colors

If all of the LED strip colors work except for one, and that one color doesn't work anywhere along the strip (for example, all of the red LEDs don't work), Consequently, there is a problem with the Red -ve cable's soldering to the strip's PCB, the Red cable connecting the strip to the receiver, or the Red cable's connection to the receiver. A Red LED cannot be broken over its entire length. Thus we may conclude this with some degree of assuranc

e. Instead, a bad LED will only affect the area between the cut points because of how LED strips are made. So, the problem is with the wiring.

Ensure the cables between the controller and the strip work, primarily if you use a connector block to keep the wires longer. For a good test, you must get rid of all extension cables and control equipment and connect the power supply directly to the strip. Also, remember that black is always positive (+) on RGB/RGBW strips. So, first connect the power source’s positive wire to the LED strip’s black wire. Then connect the -ve from the power supply to the cable for the color that isn’t working.

Let’s say that the problem is with the blue cable. The blue lights should then turn on to show that they are working, which means you have a weak connection somewhere else. Using this information, slowly put the system back together, including the controller and any extension cables, and see which part stops the Blue lights from working.

My LEDs Are So Hot They Are Nearly Burning To Touch

There could be two possible reasons why this is happening. Either your 12V LED strips are connected to a 24V power supply, another possibility is that there is a “short” along the strip, which means that the solder has crossed the PCB and the +ve and -ve are touching, making the circuit short. Also, If you have an output cable, the output positive and negative terminals may touch one another.

If the problem is caused by putting 24 volts on a 12-volt strip, the strips will still work. Since you’re sending more than twice as much power, they will look brighter than they should. But the problem is that doing so can increase the chance of a fire and cause the LEDs to get very damaged (often within hours). If true, the strips will break within a few hours, and the LEDs will be damaged if the positive and negative ends touch somewhere. Even the smell of something burning could be dangerous.

If a 24V power supply is powering 12V strips, you will need to get a 12V power supply or find a converter that lowers 24V to 12V. (In this case, the wiring would go between the power supply and the strip).

Whether you think or not there is a “short,” you need to look closely at each piece of the strip to see if any solder is crossing the connections. I

f so, you can use a knife to cut the solder so that the positive and negative ends don’t touch anymore, or you can resolder it.

My LED Strips Are Tripping My Breaker

There could be two reasons for this. Your power supply might not be working. If not, your breaker won’t be able to handle the considerable amount of current all at once.

If you think one of the power supplies is broken, disconnect them from the breaker and try to reconnect them one at a time, adding another each time until the breaker trips. Then you’ll know which one is wrong. If a breaker trips even though there are many power sources connected and none are broken, That circuit breaker can’t handle the input current. There will be a need to make the breakers bigger. If it keeps going off, try putting the power sources on different breakers.

My LEDs Brightness Decrease Toward The End

Your LEDs are less bright towards the end because there is a drop in voltage across the strip.

Most common LED strips can be powered from one end and can be used up to 5 meters long without voltage drops that can be seen. (Some specialty strips are 10m, 15m, or 20m long.)

So, If you put two 5 m strips together and powered them from one end, the light would get dimmer as you got closer to the end. You should either: (A) split the strip up and connect the two 5 m strips in parallel or (B) install a ring main with a starter lead and an exit lead on the 10 m, and connect both cables back to the same power source.

My LEDs Smell Like They’re Burning - When Left Coiled Up

If you turn on the LED strips and leave them on the reel or still wound up, the heat will cause them to get very hot and burn out.

Only test the strips when they aren’t wound up. They can’t be coiled in any way.

My Strips Are Showing Inconsistent Colors In Patches

If you have a cold white strip and then see warm white in random areas of, say, 50mm (or they look “wrong”), this is because the warm white was painted on. This often happens when painters come in to paint and don’t know there are LED strips in the room because they are hidden.

The strips can sometimes be saved depending on how much paint there is. You can wipe off the paint on the strips. Only use products that don’t contain water to keep the LEDs from getting damaged. A fine knife can also peel the dried paint off the LEDs. Make sure the strips are turned off.

My LEDs Do Not Light Up At All

If the LEDs don’t light up, it could be because the power supply is broken.

Try connecting a different power source into the same strip if you have more than one to check if it now functions. If it does, your power supply is broken, and you need a new one.

My RGB/W LEDs Are Only Lighting Up A Low (RED) Glow

24V LED strips are hooked up to a 12V power source.

The only option in this situation is to buy another 24v power source for your 24v strips.

When I Select Colors For My RGB/RGBW Strip, They Are All Wrong

You have crossed over the wires on the controller. If you connect the Red cable to the Blue terminal and the Blue cable to the Red terminal, for example, when you choose a color on your controller, the colors won’t be mixed right, and you’ll see different light colors than the ones you chose.

The cables need to be checked, and any crossed over the need to be rewired to go to the right places. You could also check the connections if you used a cable connector to make the cord longer. When the cables sometimes touch, it’ s hard to tell what will happen. If, for example, Red and Blue are touching, you must separate the wires to ensure the connections are clear and free of noise.

LED Strip Adhesive Is Losing Adhesion

The LED strips are easy to put up in almost every situation. The most important things about this kind of lighting are that it is flexible and sticks well. But what do you do if the glue doesn’ t work?

This problem could happen to beginners who take the lid off too soon. Choose where you want the strip to go before you remove the cover that keeps the adhesive from drying out. More importantly, ensure the area is clean before putting it there. There shouldn’ t be any dust or powder where you put the LED strip. A screw is often used to fix light strips that won’ t stick anymore. Just make sure that the screw is behind the string of LEDs. The main goal is to clamp it without damaging it or putting too much pressure on it.

More information, you can read How to Choose The Right Adhesive Tapes For LED Strip.

Parts Of The LED Strip Do Not Light Up

A possible “open circuit” exists in one of the sections if a segment of an illuminated LED strip has a piece with only 3 LEDs (or 6 LEDs for 24V) that does not light up.

This means that a single LED or part for a single section has come loose because of a manufacturing flaw or mechanical damage during shipping or installation. This has cut off the power to all of the LEDs in that section.

If you have soldering skills, consider warming the solder joints for each LED and other components along that non-functioning segment. If not, the best thing to do would be to ask your supplier for a replacement (if they have a warranty) or just cut along the cut lines to remove the broken part and then use connector clips to put the two pieces back together.

LED Strip Showing The Wrong Color

Even though you put in your strip light, you see a color change. Or maybe the wrong color shows up all at once. You try to figure out what’s happening but can’t figure out why things have changed. First, the color you see comes from how brightly the photons shine. That is the result of many different parts. In reality, each manufacturer uses other raw materials to make the different colors of LED strip lights.

LEDs that come in different colors make light in a new way. RGB stands for the words “Red, Green, and Blue.” This color model is what makes the many bright pairs. If the wrong color is present, one of the three primary colors is not turned on. Most likely, a resistor was bent so much that it no longer worked.

Here is a solution to this problem that has to do with technology. First, look for the LED diodes with three primary colors that aren’t working. If you find a broken resistor, you can either try to fix it yourself or call customer service. This shouldn’t be a problem with flexible strip lights. If you can’t find a broken resistor, look for the four wires that control the three primary colors. The fourth shows how much voltage there is. It could be that the wires were switched during the making process. You can fix it by changing the wires.

LED Light Strip Won’t Turn On

When you just unplugged the strip light, was it still on? You might have put it back on, but nothing happened.

Sometimes, you might be in a hurry. But strip lights that aren’t very good aren’t worth your time. Before throwing away your LEDs, check if the power supply works. Most of the time, the power source doesn’t work or breaks down. If unsure, take your power source to a shop that fixes electronics for a quick test. It only takes a few seconds to test.

If your product uses batteries, try putting in new ones. This also applies to your remote control. If something goes wrong, check the cables. Bad connections between the wires can make your strip light up wrong.

The LED Light Strip Can’t Fully Shut Down Or Won’t Turn Off

The LED strip stays on even when the switch is turned off. You quickly tried different things to figure out what was causing the irregular luminescence. But you don’t have any more ways to figure out what’s wrong. If you use the remote to turn it off, sometimes only one color stays on.

LED power supply circuits can be easy to figure out. They change very quickly. Also, their technology works with technology that uses silicon-integrated circuits. LEDs, on the other hand, also need a steady current. So, the electronic switch system has a job to do. To solve this issue, you may need to install new switches compatible with LEDs, such as Z-wave.

It could be a problem with induced voltage. Move your light strip to a different spot and do some tests to figure out what’s wrong. There may be interferences that are causing the light to be dim. Usually, this can be solved by simply replacing the switches. If it is not enough, then you can get in touch with customer service.

The LED Strip Only Emits Either Red, Green, Or Blue Light

The red and blue lights stop working all of a sudden. Only the green diode is on. Even though it seems counterintuitive, there is only one viable color option. To achieve this parallel configuration, the LEDs are wired together. If one LED chip goes bad, it won’t affect the others.

First, you should do a small test. In other words, use the RGB controller to make the strip blue, red, or green. You may find that the strip works well. In this case, you should reset the LED light strip. Otherwise, keep going. After the test, turn on the strip light to check for broken resistors. You should be able to see damage on the breadboard caused by too much twisting or bending. If so, the resistor needs to be fixed.

The diodes may have finally reached the temperature that marks the end of their cycle. They could have also just died. Then you would have to use a different light strip. The size of the LED chips, on the other hand, makes it

almost impossible to fix. They are too small for regular tools to fix. Also, fixing the problem would take time and work.

LED Light Strip Remote Not Working

Everything was put together and tested at home. At first, everything seemed to work perfectly. The strip was then taken to someone else’s house or workplace. There was nothing that happened, and the remote no longer works. Aside from that, the colors no longer change. Or you can’t turn it off when you want to. In other words, the remote doesn’t work no matter what button you press.

You could switch up how you use the remote as a first step. Sometimes it’s easy to forget where or how far something is. Try moving the sensor to get rid of this minor annoyance. You might need to reset the remote if the problem isn’t dead batteries. Then you have to put it back together with the strip light.

A good connection should also be made between the receiver unit, the power source, and the LED strip. Rarely do remote controls stop working. On the other hand, cheap universal remote control dimmers might stop working. If so, look for remote control models compatible with your brand, especially if it is still covered by warranty. Lastly, take some steps when you move the LED strip to a new place. Use padding or a container that can handle the heat.

LED Light Strip Connector Not Working

There are times when you need a specific connector. For example, the shape of the LS-12 connector is meant to make it easier to turn. Or a stiff LS-13 connector for angles of 90 degrees.

People have the most trouble with the first connection. Simply put, your LED light strip will have points that can be cut. When you do, this is where the connection happens.

If you open up the connector, you can see the two connections. After that, put the strip into the connector. More importantly, don’t use it forcefully. Just put the strip into each side’s connector.

Most likely, you did not get the polarity of the connector right. Your comic strip does have both good and bad parts. A click when closing the connector will confirm that everything is in its proper location. If the lids don’t stay shut, go back and carefully put the strip back on.

After all this, you are ready to light your strip for a test. As you might expect, there are different connectors for RGB, RGB W, plain color, and white strips that can be changed. In the end, the fact that they look different doesn’t matter. Simply attach the strip’s right end to the connector’s copper portion to solve any issues. If you make good contact, the strip will work.

LED Light Strip Stuck On One Color

A problem with a color that is stuck could happen at any time. You might have been doing your chores and then going straight home.

At the moment, the LED strip only shows one color. You did everything possible, but nothing seemed to solve the problem. You should never press hard on the LEDs on the strip. At their core, all LED strips are made the same way. So, you shouldn’t try to move the diodes back where they belong. That is not what started the problem. Most likely, the controller is stuck. More specifically, the settings for the driver are no longer working right.

Let’s talk about how to fix this instead of the many things that could have caused it. Your strip light is easy to fix if it has a fast reset. If your LED strip did not come with instructions, this is the usual way to fix it. Start by connecting everything as expected. After that, plug in the power adapter. After about five or six seconds, unplug it. The strip light will go out. Repeat this cycle until the strip light goes back to the factory setting. Most of the time, you need between five and ten cycles. Before you plug in the power supply, let it run for a few seconds.

At The End Of The Strip, The Color Of The Light Is Different

On one of the LED strips, some of the LEDs start very dim and go out at the end. The color of the light also varies a lot. This may be due to absorption. All you have to do to fix this is move it. You could also use a differen

t light strip to make a quick diagnostic test. Switch them and see if both of them have the same problem.

If the second LED light works fine, it’ s possible that the first one was broken somehow. For example, an LED strip should never be bent by less than one degree. Even better, in a straight line. On the other hand, a similar result gives you more information, specifically that the strip might need more power.

You could also try a different method to fix the voltage drop. Use more than one LED driver instead of just one. While you’ re there, check for crossed wires, which could be the problem. Sometimes, wires that should never touch are stacked on top of each other.

Problems Related To Cutting LED Strip Lights

The LED strip might need to be cut. But you can’ t find the mark that was pointed out. LED light strips are easy to cut and don’ t lose any usefulness when cut.

All you need is the following:

- A good pair of scissors
- A ruler or tape measure
- A soldering iron

Each set of cutting marks on most strips is about two inches apart (5 cm). You must unroll if the printer missed a place to cut the strip. There can be mistakes in printing. If a strip of material was improperly cut, you could not do anything to restore it. You need to find a single mark for cutting. The ruler can then be used to measure the following points. Of course, you want to go as far as you can. Then, the first section can be left out to make a test.

Also, making a precise cut takes a lot of accuracies. For the best results, ask for help from the person holding the strip in place. Once everything is done, solder the connections. After a brief test, place the strips where you need them.

The LED Strip Only Lights Up When I Touch It

You might have more than one strip of LED lights. When you accidentally touch one of these, it will sometimes light up. Some of your strips act the same way every time, but others don't. So, this is what it means. Most LED strips respond to things that cause problems on the network. WiFi, a photovoltaic inverter, or a cheap impulse power supply are all examples. Experts call it "capacitive coupling." In essence, it is a transfer, which may or may not be what you want. We can discuss parasitic capacitive coupling in this situation.

Take your light strip as a first step in figuring out what's wrong. You can also find the cause of the disturbance and get rid of it. Even better, replace your power adapter with an EMC-certified power supply for your systems. That is better than a standard power noise suppressor filter.

LED Strip Lights Buzzing Noise Issue

You put two LED strips and their power supplies together a few weeks ago. The process went without a hitch. They do, in fact, do a perfect job. All of the links work perfectly. When you turn them on, they give off a beautiful light. After that, you wake up one morning. One of the two power supplies immediately starts to hiss, buzz, and make noise. When you turn on the light, it makes sense that silence comes back. What's going on?

Power supplies only last so long. Even more often, problems are already present in some products when they leave the factory. Because of this, most people are told to choose products with a guarantee. Most power adapters make some kind of buzzing sound. Maybe all that needs to be done is to find a better place for the power source. Also, ensure it's not sitting on anything that will worsen the vibrations. You might already know that a cheap adapter can get too hot. If that's the case, you'll find out at some point. That is to say. It won't work as well as it once did and eventually won't work at all.

Also, when you change colors, you might hear a buzzing sound. Even if it is not very loud, it can still be annoying. That sounds very sharp and sharp-edged. Finding the noise source is the first step in resolving the issue. Th

en, a stiff glass case can be used to muffle the high-pitched sound. You should return the item if there is no way to fix this.

More information, you can read Why Do LED Bulbs Buzz When Dimmed?

Flickering Strip Lights

You finally finished decorating your room by adding the latest RGB light strips. You decide to have a party online through social media. So you start to record a video. You notice a noticeable flickering in your stream all of a sudden. The same rules apply to how LED strip lighting works as to how LED lights do. In more detail, the visual flicker is caused by how waves tend to move. More specifically, the patterns of light waves from sources that use AC power.

You can see a flash sometimes. In this case, there is another problem. The kind of flicker that is usually caught on camera.No matter what, we can see that the lighting changes. Over time, it tends to shake or flash.

There are two ways to do this.

If you can see any flickering with your own eyes, you should check for damage or a leak. Most of the time, the problem could be caused by some moisture. The strip can sometimes be saved. But drying alone usually won't be enough.

In the second case, flickering can be fixed with just a few simple steps. The quickest fix is to use a portable battery. By getting rid of the cause, you can fix the problem. This is what the alternating current is (AC). In reality, batteries are powered by direct current (DC). For a long-lasting solution, buy LED strip lights that don't flicker.

More information, you can read Why do LED Lights Flicker on Video?

LED Strip Is Not Bright

You could see how bright the LED strip was in the store. But when you got it home, it didn't shine as much. You tried to fix the problem by moving the power source or the location. But you still don't understand what's going on. And even more so since it worked fine when you returned to the stor

e. If the light strip worked fine in the store, it might be because of a bad power source. In other words, some models require a specific voltage—for example, 12 or 24 Volts. But the wrong model will either get too hot or only give off a dim light.

If you don’t read the specs carefully, you might get an LED strip that doesn’t light up very well. It may last less long and be more likely to get too hot. Don’t use glue or acrylic cement to stick the led strip together. The ingredients in the glue could get on the LED and cause it to break down quickly.

Lastly, your LED strip may have been bent too far. Look for cracks in the strip if you see faint red, green, or blue colors. Also, the solder connections may change shape with too much heat. Because of this, the LEDs can’t light up right. Even with the right tools, it can be hard to make these repairs. Even impossible at times.

Dim At One End

Most of the time, this problem comes up with longer strips. You probably can’t figure out why the other strips you cut work fine, but the long one has this problem. Resistance gets to the heart of your “why.” In particular, a voltage drop is caused by the resistance of the metals.

The current flows through the strip because your power supply lets it. The strip keeps running into problems the whole time. In other words, as the strip gets longer, the resistance goes up. The strip won’t light up if the electricity can’t get to the other end. That is what started the problem. So, what should be done? Your LED strip needs more power.

You can use shorter LED strips for your project or reattach the strip every 20 to 30 feet (6-9 meters). To cut down on voltage drops, you can also use a wire with a thicker gauge.

Dim Over Time

Your LED lights have been there for a long time. They did a good job. But recently, they started to dim. The light has lost some brightness, so you want to make it brighter. There is no way for an LED to be bright and last lo

ng. A multicolored LED light strip can work for a few hours or a long time. Its use has some effect on how well light is spread. That is, how bright your LED lights are.

When it comes to LEDs, age is important. Different LEDs also use other technologies and change how they work over time. Over time, engineers have come up with new ways to mass-assemble and make LED devices. These, too, are made up of LED strips. Higher voltage can also cut short the life of LEDs. Diodes only do one thing. They light up before they go out. For the same reasons, your electrical system could also be to blame.

Check to see if the voltage in your circuits is still at the right level. A multimeter can measure how much the voltage in your system has dropped. After that, you can find the best way to look into the problem. Before replacing the old LED strips, try to rule out these possible causes. If you have problems with your electric system, it might be best to hire a pro. They do have more tools to deal with the problem faster and better.

More information, you can read How Long Do LED Strip Lights Last?

A Portion Of The LED Strip Does Not Light Up

Only one part of your LED strip lights up, and only half of it works. More importantly, this problem could affect a large part of the whole strip in one or more places. This problem could get worse if you put the strip into metal support. A typical aluminum profile, to give you an example. Here’s a way to fix it, so you don’t have to replace the whole light strip.

First, you should use a marker to mark the LEDs that are no longer working. The next step is to remove the strip’s power source. It is possible to repair the broken section by cutting it with a sharp box cutter. Remove the severed section next. You’ll be switching it out for a new strip of the exact dimensions. It must first be placed in the same spot as the previous one.

As you can see, there are plus and minus signs on the cutting spots. Just keep going the same way and at the same speed. Finally, use solder wire to join the edges together.

The LED Lights Won’ t Flash Or Chase

Even if you connect the strip light to power and WiFi, you still can’ t control how it works. Some LED strips don’ t seem to work as well as they are promoted. Modern LED light strips typically have their app or program to control them. They sometimes work with specific operating systems or apps that work on all systems. So, it might take a lot of work to figure out how to fix the whole problem step by step.

There are, in theory, two main reasons why a chasing LED strip light won’ t flash or chase. The first is using a dimmer. The second factor, meanwhile, has to do with the software. If you are using a dimmer, take it out. The issue will disappear after you disconnect it from the power strip. These features do not work with dimmers. If you don’ t use a dimmer, you have to connect the strip to the WiFi again. You must use the app or an online program to find the network. The LEDs must then be linked to your phone to work together. After doing this, you might need to recheck the settings. You will find that the settings don’ t usually show any pairing. So, you must either start over or ask for help.

Overheating Issue — The LED Strip Is Too Hot To Touch

When you turn it on, the LED lights are very bright. You can feel it warmer if you put your hand over the strip. The LED strip gets hot in the end. So hot that you can’ t touch it. No one should ever let their LEDs get too hot. Too much heat means that the diodes are working too hard because there is too much electricity.

To put it another way, if you use too much power or voltage, your LED strip won’ t last as long. Without testing, you probably won’ t be able to figure out what’ s wrong. It is best to test to see if there are any problems with the electrical system. If you want to figure out why your LEDs are getting too hot, here is a way to do it. Use a metal profile to get rid of heat. A simple aluminum profile will do. The metal will soak up the heat and make the LED strip cooler.

LED Lights Up And Then Turns Off

Another common problem is that these LED light strips suddenly turn on and off. This could be because of the dimmer you put in to change the brightness. These light strips can’ t be used with many of the cheap dimmers.

This problem can be fixed by replacing the dimmer in the outlet. Before you do that, read the manual to find out what kind of dimmer will work best with your light strips. If the problem keeps happening, your light tips are likely broken. So, you should get a new set.

More information, you can read How to Dim LED Strip Lights.

The Entire LED Strip Light Does Not Light Up

- Ensure the LED strip’ s voltage and the LED power supply’ s voltage are the same.
- Ensure that the (+ve) and (-ve) poles of the LED strip are connected correctly.
- If all of the above steps have been taken and the led strip is still not working, it may be broken.

A Certain Section Or Several Sections Of The LED Strip Does Not Light Up

1. Check if there are any problems with the solder joints between the FPCB and the resistors or LEDs.
2. The LED lamp’ s internal circuit could be broken. Inside the LED, the chips and brackets are connected by gold wires. If the gold wire isn’ t connected, the current won’ t flow, and the LED won’ t light up.

In The Same Section, Only One LED Is Off, And The Other LEDs Are On

1. The chip might have been burned out (you can observe whether there are black spots on the surface of the LED lamp). Possible causes include an electrostatic breakdown, an unstable LED power supply, a high inrush current, or a lack of resistance in some LED bulbs.

2. Problems with the circuitry inside the PCB cause it.

LED Strips With The Same Color Temperature From Different Factories May Have Different Luminous Colors

1. Different manufacturers have different tolerances for color temperature.
2. Even if the CCT is the same, but the DUV is different, the color will look different.

For more information, please check https://www.ledyilighting.com/wp-content/uploads/2022/12/led-color-characteristics-factsheet.pdf

The Warm White LED Strip Looks Greenish

Even though the color temperature of 2700K - 3000K LED lamp beads is bright white, the DUV value is positive, and the value is too high. The value shows how it differs too much from the black body curve above the curve.

For more information, please check https://en.wikipedia.org/wiki/Planckian_locus.

When The RGB Light Strip Is Mixed With White Color, The End Is Reddish.

The main cause of this is voltage loss. Because the RGB lamp bead is made up of red, green, and blue chips, the red chip needs less power to light up. Because of the voltage drop, the voltage at the end of the LED strip will go down. Because there needs to be more voltage, the green and blue chips aren’t as bright, but the red chip can be as bright as usual, making the end of the LED strip look red.

1. 3.0-3.2V Chip for blue LEDs
2. 3.0-3.2V Chip for green LEDs
3. 2.0 - 2.2V Chip for Red LEDs

The LED Strip Is Falling Down

LED strip lighting is a type of lighting that is often used to decorate a home. They can be used to provide general illumination or to highlight certain areas of a room, and they're simple to set up. LED strip lights can sometimes fall apart, especially if not installed correctly. The falling LED strip lights can be annoying and dangerous because they can break or cause electrical problems.

For more information, please check https://www.ledyilighting.com/how-to-stop-my-led-strip-lights-from-falling-down/.

A Specific Color Of The RGB/RGBW LED Strip Is Off

The circuit for this color is open. The chip inside the lamp bead that is this color may have a broken gold wire. A bad solder joint could also cause the open circuit in this color circuit.

The End Portion Of The SPI Addressable LED Strip Is Not Lit

Please ensure that the SPI controller can handle more pixels than the SPI LED strip. And make sure the controller is setting at the suitable pixel.

For more information, please check https://www.ledyilighting.com/the-ultimate-guide-to-addressable-led-strip/.

The LED Strip Cannot Be Dimmed

There are two types of LED strips on the market today: constant current LED strips and constant voltage LED strips. For constant recent LED strips, you need a dimming power source that sends PWM signals.

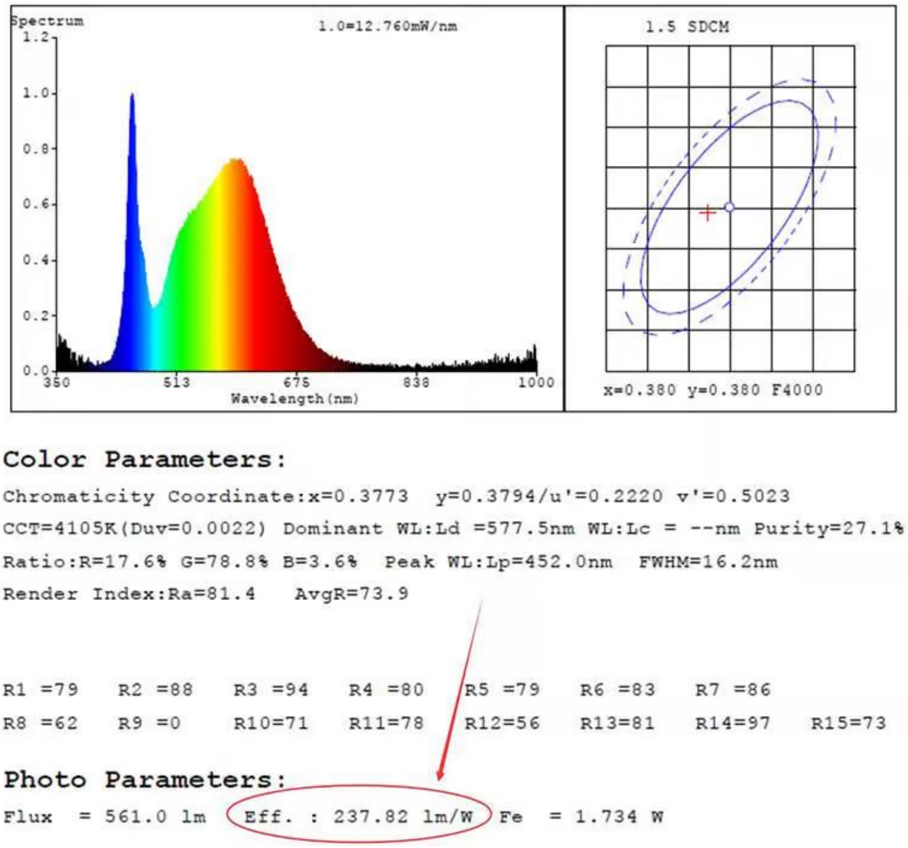
For more information, please check https://www.ledyilighting.com/super-long-constant-current-led-strip/.

What is The Brightest LED Strip

There are many different types of LED strips, each with its unique features. In this article, we will be discussing the brightest LED strip on the market.

What is the brightest LED strip on the market?

They are super light efficiency SMD2835 LED strips, 9LEDs per cut, CRI>80, more than 220LM/W, and power can exceed 20W/M. They use high brightness SMD 2835 LED with large size chip, pure copper 3OZ or 4OZ PCB.



The brightness of LED strips is determined by lumens.

Lumens = Light Output. In simple terms, Lumens (denoted by lm) are a measure of the total amount of visible light (to the human eye) from a lamp or light source.

Factors affecting the lumens of LED strips.

Two main factors affect the lumens of LED strips, light efficiency (lm/w) and power (w/m). As we know, the lumens of a LED strip are equal to the luminous efficacy multiplied by the power.

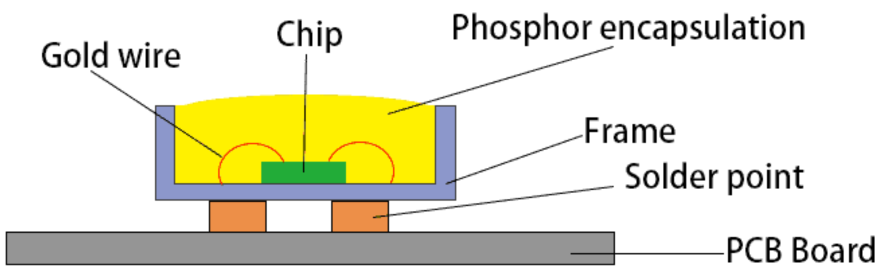
Light Efficiency

Luminous efficacy is a measure of how well a light source produces visible light. It is the ratio of luminous flux to power, measured in lumens per watt (lm/w).

The main factors that affect light efficiency are as follows:

LED Chip Size

LED lamp beads are light-emitting parts, and their main components are chips, brackets, and gold wires connecting the chips and brackets. The component that can emit light is the chip. Therefore, the size of the chip determines the luminous efficiency of the LED lamp beads. The larger the chip size, the higher the luminous efficiency of the LED lamp beads. There are some lamp bead factories on the market. To improve the luminous efficiency and reliability of white light SMD2835 LED lamp beads, two chips are packaged into a bracket.



CRI

A color rendering index (CRI) is a quantitative measure of the ability of a light source to reveal the colors of various objects faithfully in comparison with a natural or standard light source.

CRI is also an important factor in determining luminous efficiency. The higher the CRI, the lower the luminous efficiency.

If you want to know more details, please read Why High CRI is Always Less Efficient.



CCT

Color temperature (Correlated Color Temperature, or CCT, in lighting tech jargon) is essentially a gauge of how yellow or blue the color of light emitted from a light source appears. It's measured in the Kelvin unit and is most commonly found between 2200 Kelvin degrees and 6500 Kelvin degrees.

In general, the higher the CCT, the higher the light efficiency. For example, for the same LED lamp bead, the luminous efficiency of 6000K is higher than that of 2700K.

Power

When the light efficiency is certain, the higher the power, the higher the lumen.

So, if we need high brightness, we need to increase the power.

The power of the LED strip is mainly affected by the following factors:

LED Density

A single LED lamp bead has a maximum current limit. For example, the conventional SMD2835 is 60mA, and the SMD3528 is 20mA. If we want to increase the power of the LED strip, we need to increase the density of the LED lamp beads.

Note: To save costs, some manufacturers design LED strips with a current that exceeds the maximum rated current of the LED lamp beads. However, when this LED strip is working, the heat is serious, and after some time, the brightness will become lower and lower.

PCB

PCB is another key component. Its main function is to connect components such as LED lamp beads and resistors.

The main component of PCB is copper, and the amount of copper determines the conductivity of PCB. Thicker, wider copper can pass more current and generate less heat.

PCBs can also help dissipate heat faster. Heat is critical to LED life, and high heat can reduce LED life.

Therefore, to increase the power of the LED strip, we must choose a PCB with thicker and wider pure copper.

Aluminum Profile

More power means more heat. However, if the heat is not dissipated in time, it will reduce the life of the LED. One of the most common ways to help dissipate heat quickly is to attach LED strips to aluminum profiles.

What Are the Longest LED Strip Lights?

Regarding LED strip length, 5 meters/reel is the most common size. But do you know LED strips can be as long as 60 meters/reel?

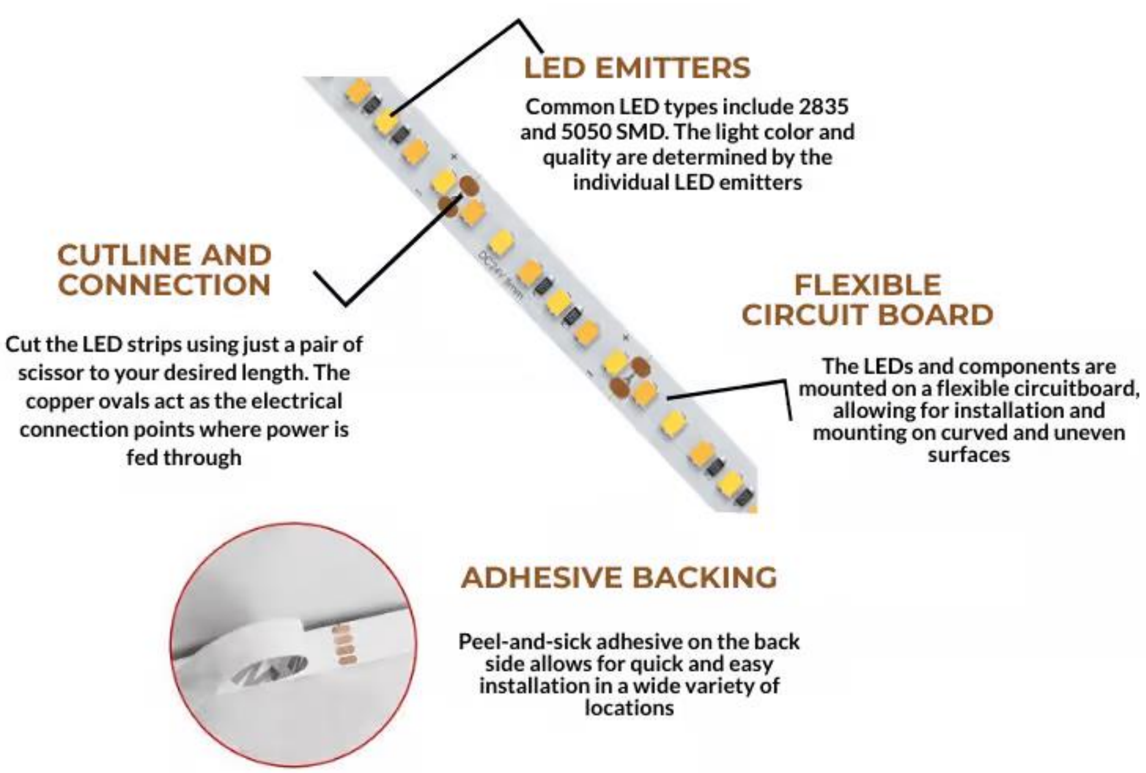
The LED strip length is measured in meters per reel. And the length of the LED strip depends on the voltage drop. Low-voltage LED strips like 12V or 24V are usually 5 meters in length. Whereas high-voltage AC LED strips with a voltage rating of 110V or 240V can go up to 50 meters in length. However, the longest LED strip available is 60 meters, providing constant brightness from end to end without any voltage drop.

In this article, we will explore different lengths of LED strips and learn about the longest LED strip length available. Here you will also know how voltage drop limits the LED length and how to increase the length of your LED strips. So, without any further delay, let's begin-

What Is LED Strip Length?

LED strips are tape or rope-like flexible light fixtures that come in reels. And the length of the strip per reel is the LED strip length. However, you can cut these strips to your required size as they have cut points.

Usually, LED strips come in a 5m reel which is the standard size. And this 5m LED strip is available mainly in two voltages, 12V, and 24V. Besides, many other length options are available for LED strips; you can also customize the length as per your requirement. But, the fact to be noted is that the voltage will also have to be increased with the increase in length. But why so? Let's find the answer in the below section.



components of led strip light

How Does Voltage Relate To Strip Length?

When purchasing an LED strip, you will find the voltage rating written side by side in the specification. This is because the voltage is deeply related to the length of the strip. How? To know that, let’ s get into some physic s.

When the length of the strip increases, the resistance of current flow and the voltage drop also increase. So, to ensure proper current flow, the volt age also has to be increased with the increment of length. So, here you nee d to keep two factors in mind-

Length ⬆ Voltage ⬆ Voltage Drop ⬇

- The voltage of the strip has to be increased with the increase in len gth to minimize the voltage drop
- With the same length, a strip with a higher voltage is better; 5m@24V is more efficient than 5m@12V

In the later section of the article, you will also learn more about the concept of voltage drop and how it affects the strip length. So, continue reading.

Different LED Strip Lengths

As you already know, the length of the LED strip depends on the voltage. Here are some common LED strip lengths for different voltage ranges:

Length Of The LED Strips	Voltage
5-meter/reel	12V/24V
20-meter/reel	24VDC
30-meter/reel	36VDC
50-meter/reel	48VDC & 48VAC/110VAC/120VAC/230VAC/240VAC
60- meter/reel	48V Constant Current

Besides these lengths, LED strips are available in other measurements also. You can also customize the LED strip lengths as per your requirement.

LED Strip Length Based on Constant Voltage

The 5-meter length of the LED strip is the most common variant available on LED strips. With this length, you will get two options: a 12V direct current and a 24V direct current.

- **5 meters@12VDC Constant Voltage**

A 5-meter, 12V LED strip usually has cut marks after every three LEDs. These are the most common types of LEDs used for indoor lighting. You can use them in your bedroom, living area, office room, and more.

- **5 meters@24VDC Constant Voltage**

LED strips of 5-meter length with 24V rating are quite similar to that of the 12V in terms of light output. However, they have different cutting mark spacing compared to 12V. Usually, 24V LED strips come with cut marks after each 6 LED.

12VDC Vs. 24VDC: Which Is Better?

For 5-meters length, keeping the LED number constant, the lighting output will be the same for 12V and 24V. The only difference will be in the combination of voltage and amperage. For example- if it is a 24W/m LED strip, for 12V, it will draw 2.0A/m. In contrast, for 24V, the same 24W/m LED strip would draw 1.0A/m. But this amperage difference will not affect the light output. Both strips will provide equal lighting. Yet, due to less amperage draw, the 24V variant is more efficient. It will work better within the LED strip and also a power supply.

Besides, if you want to increase the length of the LED strips, 24V would be best. For example- you can connect two 5-meter LED strips using an LED strip connector and thus increase its length up to 10-meters. In this case, a 12V LED strip will have more voltage drop affecting the performance of the light. So, 24V can handle twice the load of the 12V variant.

Thus, 5-meter@24V is a better option than 5-meter@12V. But, in another sense, the 5-meter@12V gives you more flexibility in sizing. So, if sizing is an issue, you can also go for 12V.

For more information, you can read How to Choose The Voltage of LED Strip? 12V or 24V?

What is a Constant Current LED Strip?

Constant Current (CC) LED strips are long-run LED strip lights. These lights offer you a more extended length per reel without the issue of voltage drop. You only need to connect the power supply to one end, and the brightness of the light will be the same from end to end. From these strips, you can achieve the length of 50-meters, 30-meters, 20-meters, and 15-meters per reel.

Features:

- Stable current
- No voltage drop
- Same brightness
- Thicker PCBs, such as 3 ounces or 4 ounces
- Has constant current ICs on the PCB or ICs inside the LED
- Silicone integrated extrusion process, IP65, IP67 up to 50-meters per reel
- CRI>90 and 3 steps Macadam

Variants Available:

- Single color
- Warm white
- Tunable white
- RGB
- RGBW
- RGBTW

LED Strip Length Based on Constant Current

The constant current LED strips can be of the following lengths-

- **50meters@48VDC Constant Current**

With a 48VDC rating, this 50-meter LED strip will have the same brightness from the start to the end. And the power needs to be connected only at one end.

- **30 meters@36VDC Constant Current**

A constant current LED strip of 30-meters will require a voltage of 36VDC to ensure continuous brightness from end to end.

- **20 meters@24VDC Constant Current**

20-meter LED strips with constant current are available at 24VDC. They will provide the same brightness from end to end. But 5-meter@24VDC constant voltage LED strips are also available. And joining four of those strips, you can make a 20-meter-long strip, so why go for 20-meter@24VDC constant current LED strips?

Extending the length of 5-meter@24VDC constant voltage will create voltage drop issues. So, to solve this problem, you will require to connect extra parallel wirings from the power supply to each new LED strip. This process will have to be repeated for each of the strips you add, which makes the circuit too complex and also kills your time. In contrast, using a 20-meter@24VDC constant current LED strip is straightforward—no need for extra wirings to keep the brightness constant.

Visit our [LEDYi website] to get premium quality constant current LED strips. Besides these above-discussed lengths, there are many more options available to us. To know more, check out [Constant Current LED Strip].



AC driverless led strip

What is an AC Driverless LED strip?

AC driverless LED strips are high-voltage LED strips. These are powered by alternating currents and don't require any driver. For this reason, they are known as AC driverless LED strips.

Traditional high-voltage LED strips have a power supply plug to change AC to DC. But these AC driverless LED strips can operate without a driver. They have a diode rectifier on the PCB and do not need a power supply plug. Moreover, the cut unit length of these strips is only 10cm, which is much smaller compared to the 50cm or 100cm cut length of the traditional ones.

Features:

- No drivers or cumbersome transformers required
- Quick install, plug and play out of the box
- No wires to cut and solder
- Long run 50-meters with just one plug-In
- Shortcutting length, 10cm/Cut
- High-Grade PVC housing for added protection
- Injection-molded end cap and solder-free & glue-free endcap
- Build-in piezoresistor and safety fuse inside; anti-lightning protection
- Perfect for indoor or outdoor applications

Length Of AC Driverless LED strips

If you want long-length LED strips to install in AC, driverless LED strips are available in a single length, 50-meters. But there are four voltage options available. These are:

- **50 Meters@110V Driverless AC LED Strip**

These 50-meter LED strips come with a voltage rating of 110V and can operate without any driver.

- **50 Meters@120V Driverless AC LED Strip**

The function of these LED strips is the same as the 110V; only there is a slight difference in the voltage. However, these two are almost close and ca

n’t be differentiated much. Yet, it uses less current to bring equal light output to 110V.

- **50 Meters@230V Driverless AC LED Strip**

The 50-meter driverless AC LED strip with 230V is more efficient than the 110V and 120V. As the length is too long, going for these strips is more reliable as they are better at emitting the issue with voltage drop.

- **50 Meters@240V Driverless AC LED Strip**

240V is the highest range for driverless AC LED strips of 50-meters. The performance of these LED strips is similar to that of 230V. But with the voltage increment, these strips become more efficient as they use less current.

These are excellent for applications where you need long-length strips. You can cover up to 50-meters with a single strip; no need to take the hassle of strip slicing and parallel wiring. Besides, these high-voltage strips provide smooth and even lighting. So, to get these high-voltage AC driverless LED strips, check out Driverless AC LED Strip Lights.



What are The Longest LED Strip Lights?

From the above section, you have already learned about different lengths of LED strips for various voltage ranges. These strip lengths were categorized based on constant voltage, constant current, and driverless AC strips. Now let’s know about the longest LED strip.

60 meters@48V Constant Current

60 meters@48V is the longest LED strip available. These super long LED strips supply constant current in the PCB that keeps equivalent brightness from end to end. Besides, there are no voltage drop issues with these strips. They are available in different variants and can be used for indoor and outdoor lighting. You can also get IP65 and IP67 ratings in these strips that ensure waterproofing. Here are the major features of 60-meter, 48V LED strips -

Features:

- Ultra Long; 60-meters
- Constant current IC on PCB; constant end-to-end brightness
- Thicker PCB; 3 oz or 4 oz
- No voltage drop problem
- 3M heat dissipation backing tape
- Driven by a single-end power supply
- Good heat dissipation function
- Less lighting degradation
- Pulse Width Modulation (PWM) dimming
- Fewer drivers
- High efficiency & lumen output; 2000lm/m
- Less wiring requirement
- Faster installation and less installation cost
- Longer lifetime

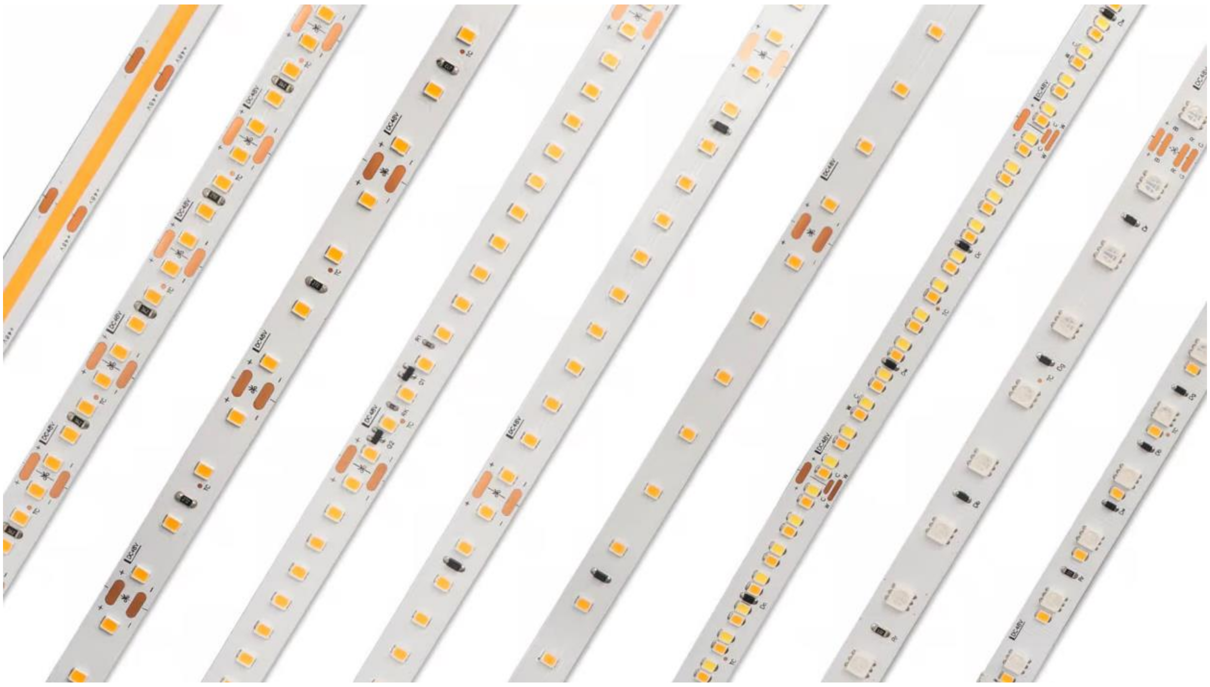
Variants Available:

- Single color
- tunable white
- RGB
- RGBW

Available IP Ratings:

- IP20 none waterproof
- IP65 silicone extrusion tube
- IP67 full silicone extrusion

If you want long-length LED strips to install in your lighting project, you can check this- 48V Super Long LED Strip. Our LEDYi LED strip of 60-meter length will provide you with all the features mentioned in this section. Besides, it also comes with a warranty of 3 - 5 years.



48v super long led strip

How Does Voltage Drop Limit The Length Of LED Strips?

The voltage loss experienced between the power source and the LEDs is known as LED strip voltage drop. It is mainly caused by the resistance of the conductor and the current passing through it.

Voltage Drop = Current x Resistance

The voltage in the LED strip's DC circuit steadily drops as it travels through the wire and the light strip itself. This occurs because of the increase in resistance. So, the higher the resistance, the greater the voltage drop.

Resistance ⬆ Voltage Drop ⬆

When you increase the length of the LED strip, the resistance increases, and so does the voltage drop. As a result, one side of your strip lights will be brighter than the other due to the extension of the strip length. Thus, the length of the LED strip is limited by the voltage drop problem.

To solve this issue, you must increase the voltage rate as you increase the length. Because when you increase the voltage, the current will be lower, and the voltage drop will be smaller. Thus, it will ensure the same brightness throughout the strip. To learn about this concept, read this article: [What is LED strip voltage drop?]

How to Increase the Running Length of LED Strips?

Increasing the length of the LED strip is to reduce the voltage drop. Here are the ways you can reduce the voltage drop of the LED strip with the increase in length-

Reduce Power Consumption of LED Strips

The power consumption of an LED strip depends on the current flow and voltage of the LED strip. Here, the current flow is directly proportional to the power. According to Ohm’s law,

Power = Voltage x Current

So, as you decrease the power, the current flow is also decreased. And so the voltage drop reduces. For this reason, reducing the power consumption will lower the current flow and the voltage drop when you increase the running length. Thus, the brightness of the light will remain constant from end to end.

Use Higher Output Voltage

Voltage loss issues affect all low-voltage LED strips, such as 5VDC, 12VDC, and 24VDC. Because, for the same amount of power consumption, the current is higher at lower voltages. In contrast, higher voltage LED strips like- 110VAC, 220VAC, and 230VAC don’t have voltage drop issues. They have a maximum run distance of 50-meters for a single-end power supply. And as you incr

ease the voltage, the current flow will decrease, reducing the voltage drop. For this reason, using higher output voltage is essential for increasing strip length.

Use Thicker and Wider PCB

In LED strips, PCB stands for Printed Circuit Board. It is also a conductor similar to wires and has its own resistance. Copper serves as the conductive material on a PCB. The longer the PCB, the higher the resistance. But with thicker and wider PCB, the resistance is reduced, and so is the voltage drop. That is why thicker and wider PCBs are used in high-voltage LED strips.

Therefore, following these factors, you can increase the length of the LED strip, keeping the glow of the LEDs perfect.

Benefit of Using Long-Run LED Strips

Long-run LED strips are excellent for installation when you have a large area to light. These are the benefits of using long-run LED strips-

- **Easy wiring, saving installation costs**

When you use small-length LED strips for large-area lighting, it requires multiple strip connections. The problem is that the voltage drop gradually increases when you join numerous strips. And so the brightness of the light decreases gradually as the current runs through the strip length. To solve this problem, each end of the strips requires parallel wiring to the power source. And this installation is very critical, so you need electricians' help, which increases your cost.

In contrast, long-run LED strips do not need any joins. You can use these strips to cover up to 50-meters of the area with one end power supply. And with super long LEDs of LEDYi, this length can extend up to 60-meters! This not only makes your wiring easy but also saves your installation cost. You can simply plug one side of the strip into the power supply, and the work is done.

- **No voltage drop issues, consistent brightness**

The common problem with low-voltage LED strips like 12V or 24V is their voltage drop. So, when you increase the length, the voltage drop increases. This hampers the strip’s brightness, and even lighting is not produced across the strip length.

Meanwhile, the long-run LED strips have high voltage, so they don’t have voltage drop issues. Due to higher voltage rates, the current flow of these strips is lower. And so, the voltage drop is also minimal. That is why you will get consistent brightness from end to end by connecting one end of these strips to the power supply. Thus, the total 50-meters of the strip will glow with equal brightness.

The Ultimate Guide To Addressable LED Strip

Due to the ease of installation, energy efficiency, and low maintenance, LED strips have been widely used in furniture, automotive, advertising, lighting, ships, bars, and other industries. Especially when you need a dynamic lighting solution, LED strips are a good choice. LED strips have different colors, such as red, green, blue, RGB, etc. It can be installed almost anywhere. It’s very hard to find another lighting solution competing with LED strips.

Addressable LED strips raise the benchmark to a whole new level. They give you more options and more excellent lighting effects such as running chases, flowing fades, meteor trails, and much more. You can even design your lighting effects with the control system. The problem is that you need to know how to choose the right addressable LED strip.

If you don’t know how to choose the right addressable LED strip yet, don’t worry. Read on to find out all you need to know about addressable LED strips

What is addressable led strip?

Individual addressable led strip is also called digital led strip, pixel led strip, magic led strip, or dream color led strip, is a led strip with control ICs that allow you to control individual LEDs or groups of LEDs. You c

an control a specific part of the led strip, which is why it is called ‘addressable’.

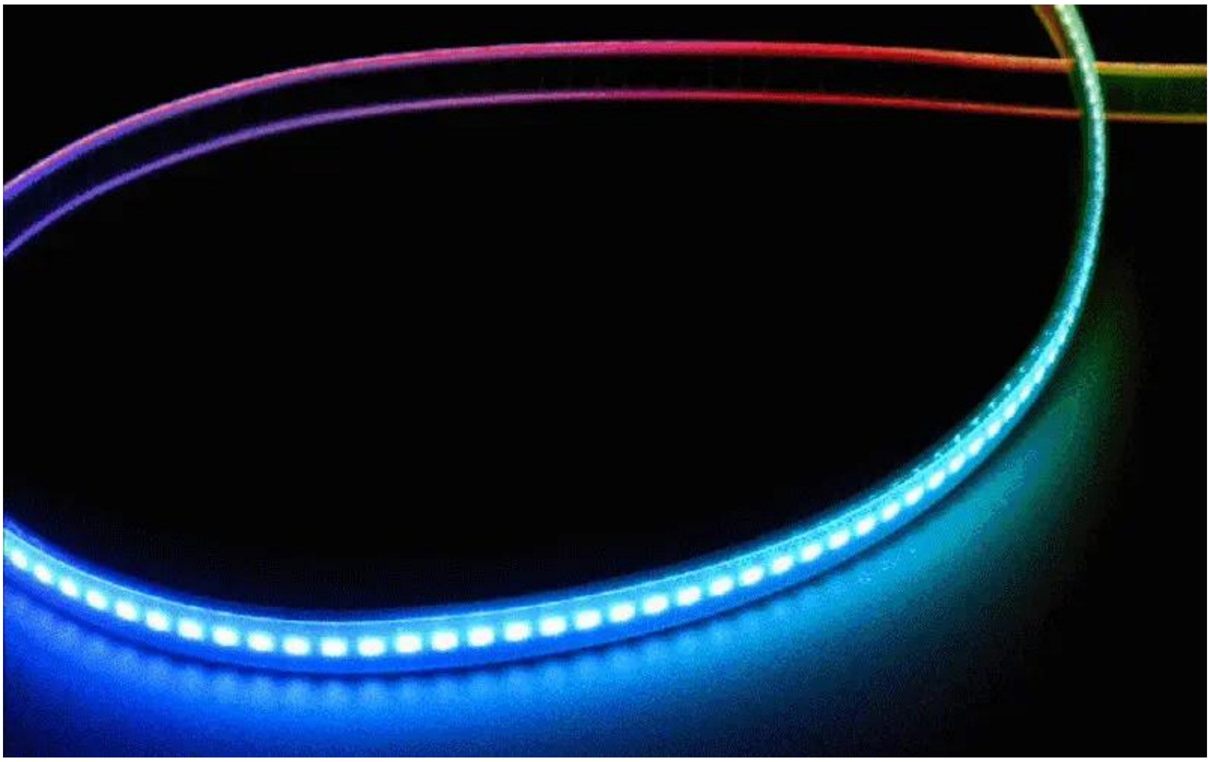
What is difference between addressable LED strip and regular analog LED strip?

Analog led strips can allow you to have one color for the whole LED strip at a time. You can change the color anytime you want for the whole led strip, but you can’t change color only for parts of LEDs.

Addressable led strips allow you to have different colors for every section of LEDs, creating various colors in different areas of one LED strip.



Regular analog led strip


Addressable led strip

How do addressable LED strip work?

The proper functioning of an addressable LED strip is achieved by five main components working together. They include

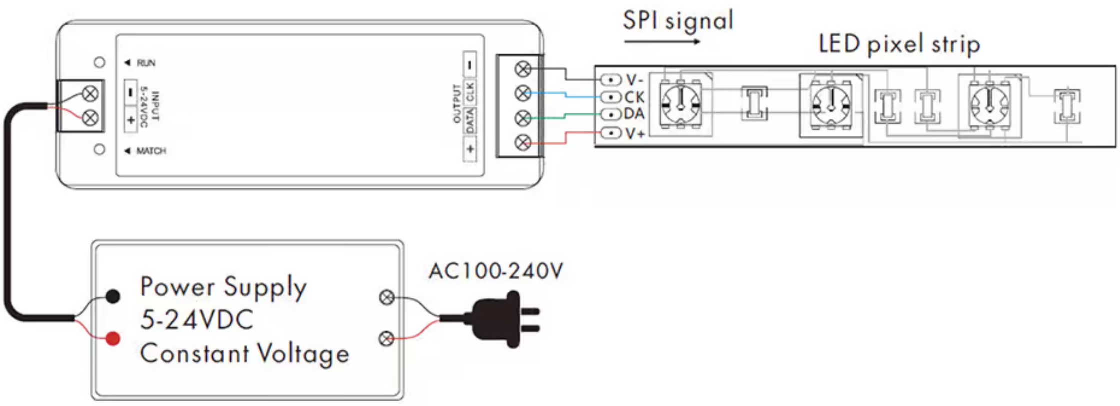
Light-emitting diodes (LEDs)

Integrated circuit chips (ICs)

FPCB (Flexible Print Circuit Board)

Power supply

Controller



Each group of LEDs has an integrated circuit chip, and this integrated circuit chip controls the change of color and brightness of this group of LEDs. This is the reason why you can control a particular group of LEDs individually. The controllers used to control addressable LED strips are also unique in that, unlike conventional RGB controllers, they generally have a data channel, and some even have a clock channel. Traditional RGB controllers have R, G, B,+ pins corresponding to the RGB strips.

The workflow of the addressable LED strip is, therefore, as follows.

When switching the power, the current passed through the LEDs, causing LEDs to light up at their default settings.

To create an effect, you need to enter a command on the controller to control the color and brightness change of a specific group of LEDs.

The controller then passes the appropriate signals to the IC chips on these LEDs, which execute the command to control the LEDs' color and brightness change.

What are addressable led strips used for?

Decoration Lighting
Addressable LED strips can be widely used in KTV, bars, gyms, etc.

Building facades Lighting
Addressable LED strips can be used on the facades of tall buildings, on bridges, etc.

Special Event Lighting
Addressable LED strips can be used for Christmas, concerts, etc.

Home Lighting
Addressable LED strips can be used to decorate the home environment and create a festive, cozy feel.



Type of addressable led strip?

Addressable LED strips are divided into two main categories, [DMX512 addressable led strip] and [SPI addressable led strip].



DMX512 Addressable led strip



SPI Addressable led strip

DMX512 addressable led strip

DMX512 stands for digital multiplex 512. This means that 512 channels are controlled digitally through 1 data cable. DMX512 is a standard for digital communication networks that are commonly used to control lighting and effects. It was originally intended as a standardized method for controlling stage lighting dimmers, which, prior to DMX512, had employed various incompatible proprietary protocols.

The DMX512 addressable led strip is an LED strip that receives DMX512 signals directly, without a DMX512 decoder, and changes the color and brightness of the light according to the signal.

SPI addressable led strip

The Serial Peripheral Interface (SPI) is a synchronous serial communication interface specification used for short-distance communication, primarily in embedded systems. The interface was developed by Motorola in the mid-1980s and has become a de facto standard. Typical applications include Secure Digital cards and liquid crystal displays.

The SPI addressable led strip is an LED strip that receives SPI signals directly, and changes the color and brightness of the light according to the signal.

DMX512 Vs. SPI

DMX512 is an internationally standardized protocol, while the SPI protocol varies according to the factory of each IC.

Signal protocol
DMX512: Parallel, synchronous parallel interface signal transmission technology, a universal signal control protocol for digital lighting equipment
SPI: Serial (synchronous serial interface signal transmission technology)

Wring
DMX512: More complicated
SPI: Easy wiring

Compatibility
DMX512: Good, unified IC category/protocol, and DMX512 is used for some luminaires
SPI: Relatively inferior, with various lC categories and slightly different protocols, basically no SPI luminaires

Reliability
DMX512: Breakpoint transmission, parallel transmission of signals, with high reliability

SPI: Breakpoint transmission, no renewed transmission of two successive breakpoints

Anti-interference of signals
DMX512: Good, with strong long-distance communication anti-interference capability
SPI: Inferior, long-distance communication is subject to strong current/strong magnetic disturbances

Overall cost
DMX512: High
SPI: Low

Application
DMX512: Indoor and outdoor large & ultra-large advertisement lighting and synchronous control of light show
SPI: Small spaces/ independent styling/ supporting facilities

How to choose the right addressable led strip?

While the principles of addressable LED strips are mostly the same, some key parameters affect the product's performance. Parameters that are worth your time and consideration are as follows:

Voltage

Addressable led strips generally come in 5V, 12V, 24V. Generally speaking, the higher the voltage, the better. If you want to understand why this is the case, the answer is the voltage drop.

What is voltage drop?

Voltage drop causes LED strips to lose their intensity as the strip becomes longer. LEDs at the beginning of the strip (nearest the power supply) will shine brightly. Whereas, LEDs at the end of the strip will have a dimmed appearance.

Why does voltage happen?

Any length of wire has a certain amount of electrical resistance. The longer the wire, the more the resistance. Electrical resistance causes voltage d

rop and voltage drop causes your LEDs to dim.
Therefore, LEDs at the end of a strip will always be getting less voltage than the LEDs at the beginning.
If you make the strip long enough, the drop in voltage will become significant enough to cause a visible difference in brightness.

Not all addressable led types have a high voltage of 24 V or 12 V. However, we can solve the voltage drop problem by connecting both ends of the led strip to the power supply.

Power consumption

The more power, the brighter it will be. The amount of power consumption you choose depends on the brightness level you need.

Type of Colors

The addressable LED strip is available in a wide range of colors.

Single Color: White, Warm White, Red, Green, Blue, Yellow, Pink, etc.

Dual Color: White + Warm White, Red + Blue, etc.

RGB

RGB + White

RGB + Warm White + White

Type of Integrated circuit chips (ICs)

DMX512 is an international standard protocol. Different types of DMX512 ICs may have different performances, but the supported protocols are the same, which means that the same DMX512 controller can control different types of DMX512 ICs. However, SPI is not an international standard protocol. SPI ICs produced by different manufacturers support different protocols, which means that different SPI ICs may need to be used with different SPI controllers. Below I list the common IC models on the market.

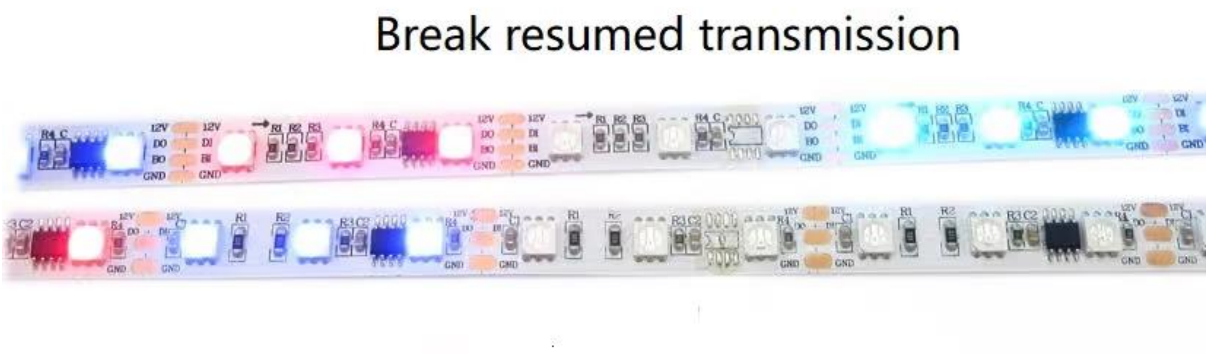
DMX512 addressable led strip: UCS512, SM17512

SPI addressable IC is divided into built-in IC and external IC or divided into resumed transmission with breakpoint and resumed transmission without breakpoint or divided into with clock channel and without clock channel.

SPI Addressable led strip common built-in IC models: WS2812B, WS2813, WS2815B, SK6812, SK9822, APA102, CS2803, CS8812B
SPI Addressable led strip common external IC models: WS2801, WS2811, WS2818, UCS1903, TM1814, TM1914, TM1812, CS8208, CS6816, CS6814, LPD8806

What is brakpoint resume function of SPI addressable led strip?

The breakpoint resume function means that when only one IC fails, the signal can still be passed on to subsequent ICs.



SPI Addressable led strip common IC models with breakpoint resume function: WS2813, WS2815B, CS2803, CS8812B, WS2818, TM1914, CS8208
SPI Addressable led strip common IC models without breakpoint resume function: WS2812B, SK6812, SK9822, APA102, WS2801, WS2811, UCS1903, TM1814, TM1812, CS6816, CS6814, LPD8806

Common IC models with clock channel: SK9822, APA102, WS2801, LPD8806
Common IC models without clock channel: WS2812B, WS2813, WS2815B, SK6812, CS2803, CS8812B, WS2811, WS2818, UCS1903, TM1814, TM1914, TM1812, CS8208, CS6816, CS6814

IC Specification Download

SK2813-RGB-LED specification

SK6812-RGB-LED specification

SK6812-RGBW-LED specification

SK9822-RGB-LED specification

WS2811 specification

APA102 specification

TM1814 specification

UCS1903 specification

UCS2904 specification

WS2812B specification

WS2813 specification

WS2815B specification

WS2818A specification

LEDs Density

LED density refers to the number of LEDs by one meter of addressable LED strips. The higher the LED density, the more uniform light, the higher brightness, and no light spots.

IP Grade

IP Code or Ingress Protection Code is defined in IEC 60529 which classifies and rates the degree of protection provided by mechanical casings and electrical enclosures against intrusion, dust, accidental contact, and water. It is published in the European Union by CENELEC as EN 60529.

If you need to install addressable LED strips outdoors, you need to use IP65 or higher IP grade addressable LED strips. However, for installations that are submerged in water for short periods, IP67 or even IP68 would be safer.

How to wire addressable led strip?

Before controlling the DMX512 addressable led strip, you need to use the ‘address writer’ provided by the IC manufacturer to set the dmx512 address into DMX512 ICs. You only need to set the dmx512 address once, and the DMX512 IC will save the data, even if the power is turned off. Please check the how to set dmx512 address video below:

But, the SPI addressable led strip does not need to set the address before use.

SPI addressable led strips will have different outlets wire according to different functions, and their wiring diagrams will also be different.

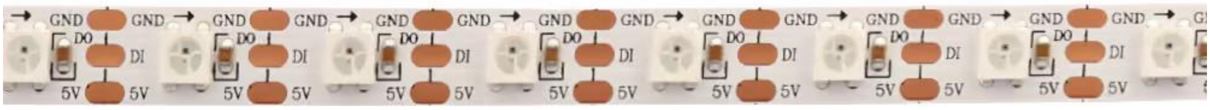
Addressable led strip without breakpoint resume function, only has data channel.

The addressable led strip with the resumable transmission function will have a data channel and a spare data channel.

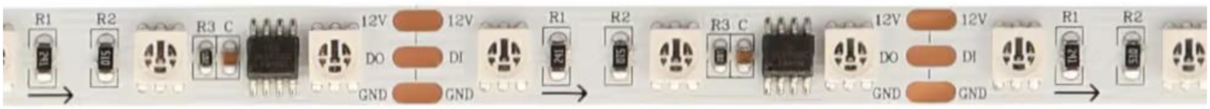
Addressable led strip with clock channel function have a data channel and a clock channel.

The data channel is generally represented by the letter D on the PCB, the spare data channel is represented by the letter B, and the clock channel is represented by the letter C.

SPI built-in IC addressable led strip



SPI external IC addressable led strip



With clock channel SPI IC addressable led strip

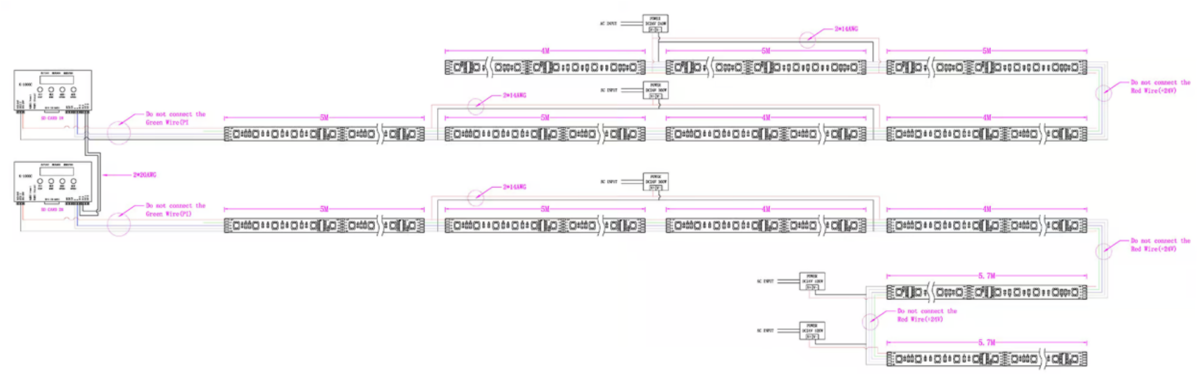


With break resume transmission function SPI IC addressable led strip

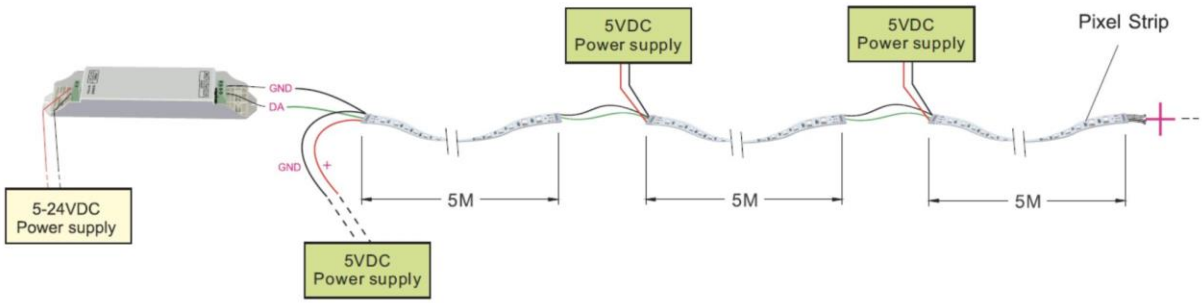


DMX512 Addressable led strip wiring diagram

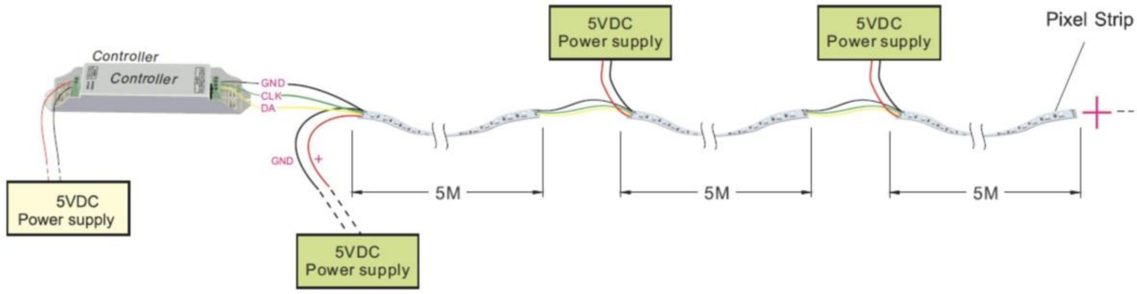
Click here to check the high quality PDF DMX512 wiring diagram



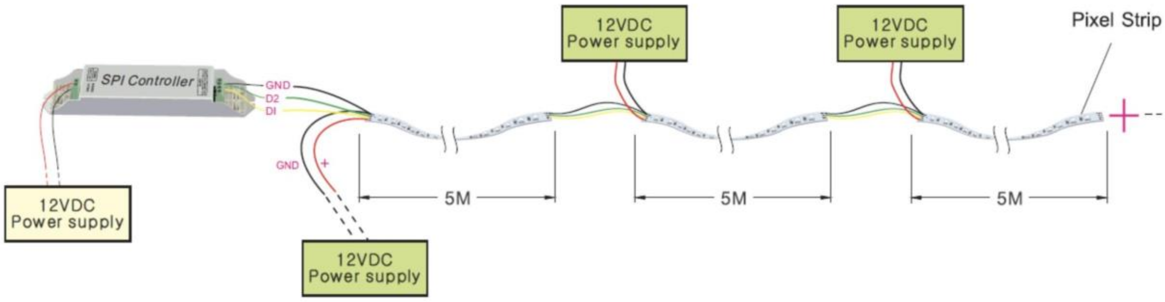
SPI Addressable led strip with only data channel wiring diagram



SPI Addressable led strip with only data channel and clock channel



SPI Addressable led strip with only data channel and break resume channel



How to control addressable led strip?

You can control dmx512 addressable led strips through dmx512 controller or dmx512 master.

In the same way, you can control SPI addressable led strips through an SPI controller.

How to customize addressable LED strip for your lighting projects?



Step 1: You must have a rough idea of what lighting effect you need and then think in-depth to specify your requirements. The more, the better. This will ease your communication with the Chinese LED strip manufacturers.

Step 2: Contact some Chinese LED strip manufacturers, tell them what you need and ideally come up with drawings showing how big the place is, where the LED strip should be installed and what kind of lighting effect you want it to be. For lighting effects, I would suggest you go to YouTube and find some existing examples and share them with the manufacturer, and they know better what you need. In short, you want to provide as much detail as possible to the LED strip manufacturer.

Step 3: When the sales person from the Chinese manufacturer gets your exact requirements, they will discuss with the electrical engineer and work out how many LED strips are needed, plus how many LED controllers and how many LED power supplies.

Step 4: The sales person will then discuss how to implement your lighting effect with the lighting designer or programmer, which is currently mainly based on the LedEdit or Madrix platforms. Given that not many LED strip manu

facturers in China can offer lighting design services, not to mention that only a few can program based on Madrix software. You may need some patience to finally find a Chinese LED manufacturer that can offer this programming service.

Step 5: The sales person will discuss further specifics with you and then quote a price. After confirming back and forth, you hand over the order to the Chinese LED strip manufacturer.

Step 6: Once production is complete, the manufacturer sends you the entire shipment.

Step 7: You will need to hire some experts or electricians to install the customized LED strips. As everything is calculated based on the given project site information, the LED strip manufacturer in China will usually design and provide you with a wiring diagram for the installation. Therefore, follow the instructions to complete the job.

Step 8: Installation and lighting commissioning. Please note that only a few LED strip manufacturers in China can offer this service by sending their field engineers to your site to do the whole job.

Where to Buy Addressable LED Strip?

Addressable LED strips are much more complicated than the regularly led strips. This is why it is more challenging that you choose the right addressable LED strip manufacturer. You can find the addressable led strip manufacturer in the following ways.

1. Amazon
2. Alibaba
3. Find the led strip factory through exhibitions or Google

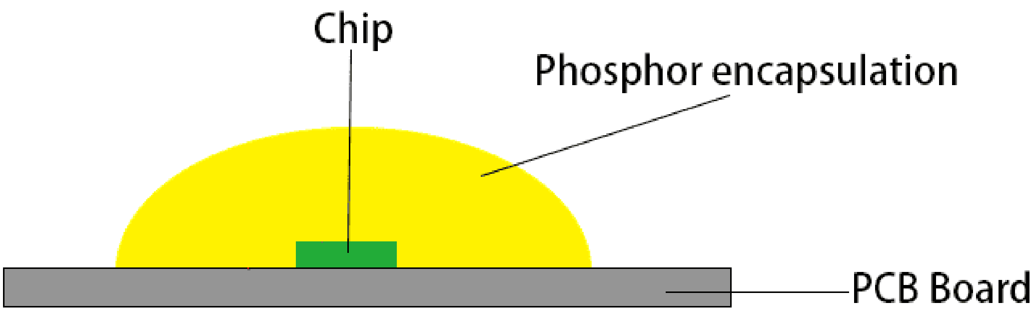
All you need to know before buying COB led strip

LED strips have been a trendy DIY lighting solution for many applications for many years. That' s why we are so interested in the latest LED strip technology, flexible COB led strip lighting.

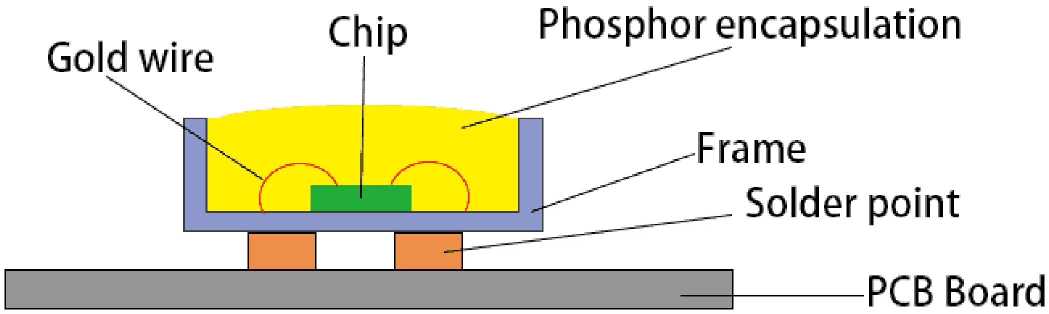
What is COB?

COB stands for Chip on Board in the LED field, which basically means that the LED chip is packaged directly on the circuit board (PCB). "Chip on Board" LEDs for flexible strip lights are sometimes referred to as flip-chips.

Flip chip LEDs are basically a bare-bones approach to LED construction. Take a look at an ordinary SMD (Surface Mount Device) LED. It has a Lamp bead holder that package the LED chip and then covers it with a phosphor coating. The 'flip chip' that makes up the COB LED strip removes everything from its design, except for the LED chip, yellow phosphor cover layer, and connection pads.



COB



SMD

What is COB LED strip light?

COB LED strip light or COB LED tape light, which is LED chips directly attached to the FPCB(Flexible Print Circuit Board), is a continuous and dotless led strip light. So, COB LED strip light is also called continuous led strip light or dotless led strip lights.

COB VS SMD led strip?

1. COB led strip beam angle is 180 degree, SMD led strip beam angle is 120 degree.
2. COB led strip is better flexibility than SMD led strip.
3. COB led strip is uniform light, dotless.
4. COB means chip on board, COB led strip don’t has gold wire, but SMD led strip has gold wire.

How is COB LED flexible strip manufactured?

1. Expanding Chips
2. Die bonding
3. Resistors onto FPCB
4. Reflow-High temperature over 65 degrees for finished PCB with chips and resistors
5. Fluorescent Powder glue mixing

6. Drop the mixing glue on the surface of chips and resistors by auto glue machine
7. Put glued cob led strip into the oven
8. QC-testing the cob led strip after cooling
9. Soldering the PCB into 5 meters per reel or the length as customer request
10. Aging test, QC test, packing, then shipping

Advantages and Disadvantages of COB LED Flex Strips

Now that you have a basic understanding of how this new COB led strip is produced, it’s time to see its advantages and disadvantages.

Advantages:

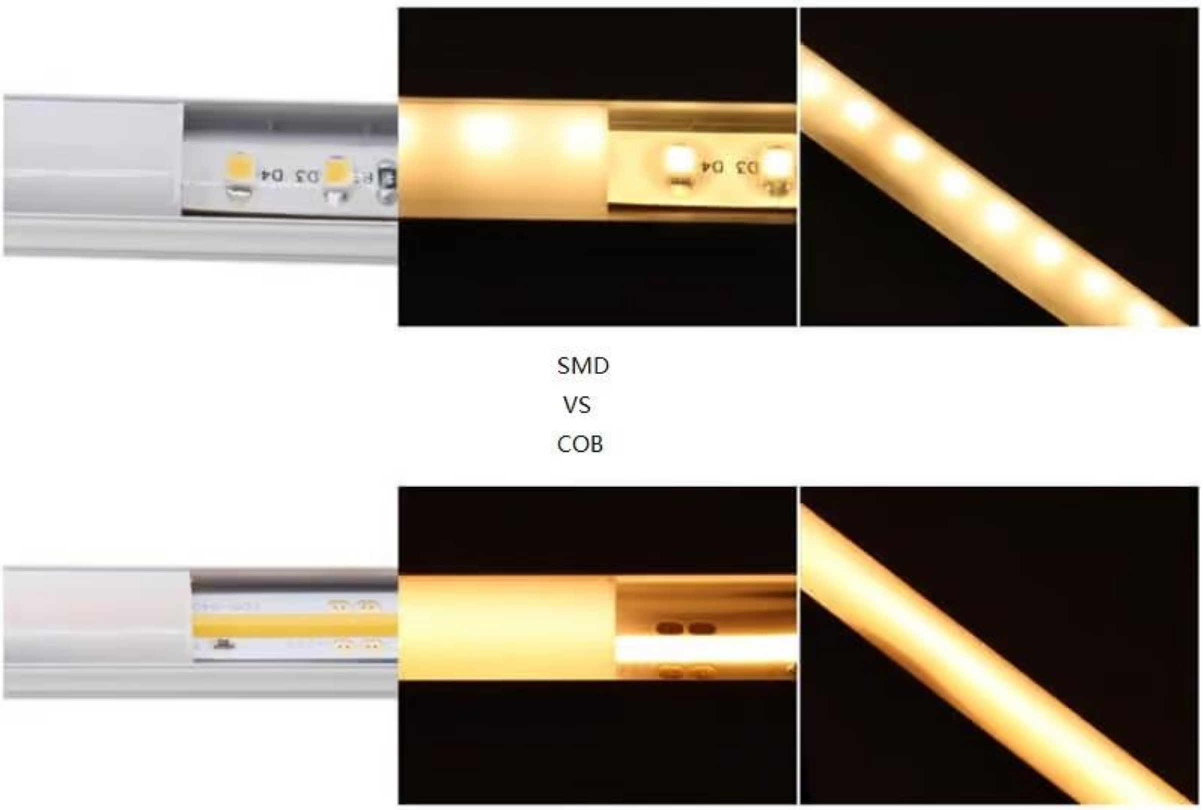
No LED lighting dot, even without aluminum profiles.

One of the biggest complaints about traditional LED strips is the lighting dot throughout the strip. A lighting dot is a bright area through the strip where you can see where the light is coming from. Light is more soft and attractive when it looks like a smooth light source rather than a lighting dot mess.

With 5050 SMD flex strips, the larger diodes are squeezed close enough so that the light is spread out and consistent across the illuminated surface at a distance. But if the light is too close to the surface or the strip itself is visible, the hot spot is an obstacle that the human eye cannot ignore.

With a 480 chip/M COB strip, it is pretty challenging to pick out any hot spots on the COB flex strip. This strip shines a soft, uniform light from end to end. Even light with no lighting dot is more attractive to the human eye and gives off a steady light even in the narrow places. The only natural way to see the lighting dot is to look at the back of the strip, where it is easier to see the individually placed flip-chip LEDs. You can only see the individual led if you dim strip down to about 5% brightness. This makes COB flex strips ideal for applications where

1. The led strip itself cannot be hidden from view.
2. The surface being illuminated is within 2 feet of the light bar.
3. Reflective surfaces like granite/glass are all around.
4. Those applications where you want an excellent neon effect.



More flexibility

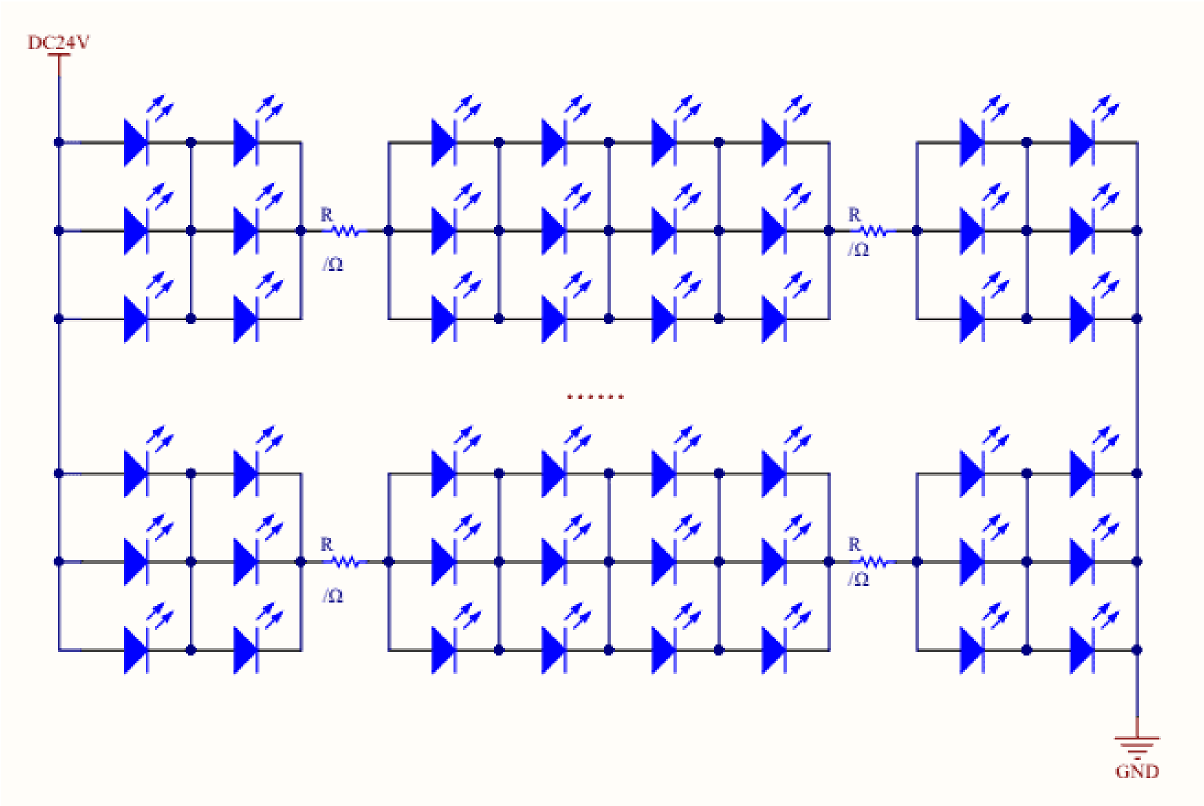
These strips are much more flexible than other flexible strips because of the small size of the diodes and the uniform weight distribution. These diodes are so small and closely spaced that no point of the strip is the same. This uniformity makes it easy to set up the strips without planning around a 5050 SMD LED sticking out where you don’t need it. This extra flexibility will make it easier for them to fit into tight areas and turn corners in your application.

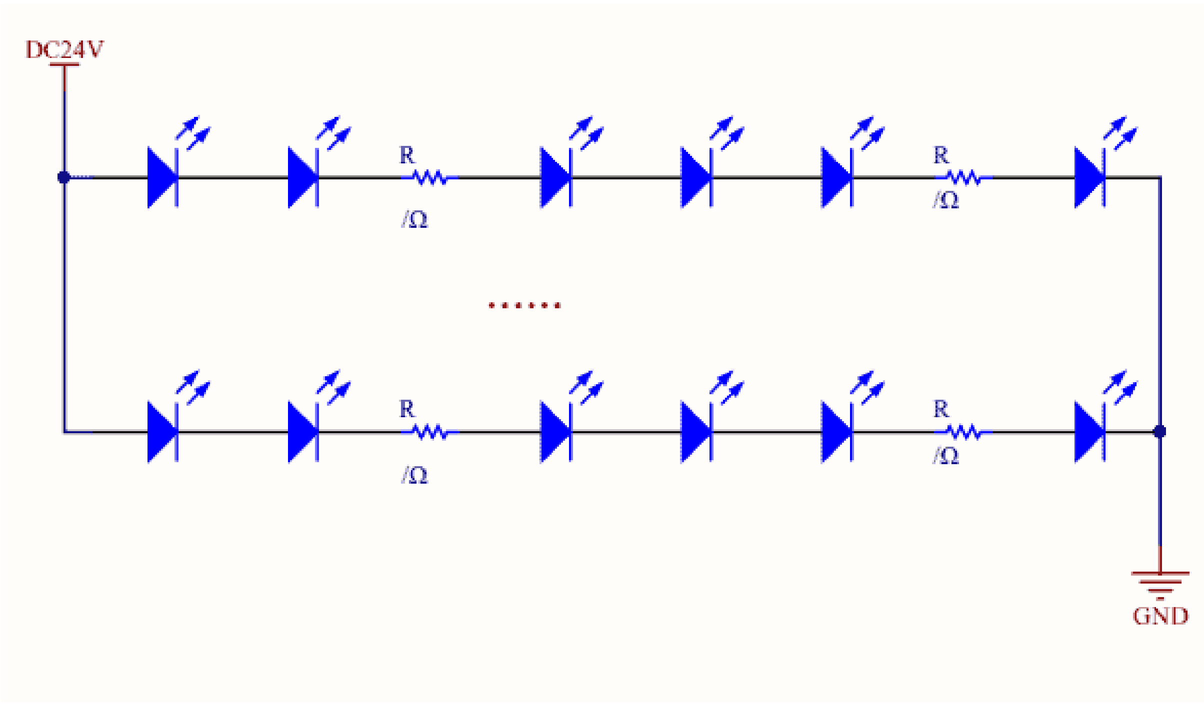


More stable, fewer problems

1. COB strip is the chip directly attached to the FPCB, does not come with gold wire. Traditional SMD LED strip, very many problems are caused by the gold wire inside the LED beads. Because the gold wire is too small, it is straightforward to be broken, leading to the chip not being illuminated.

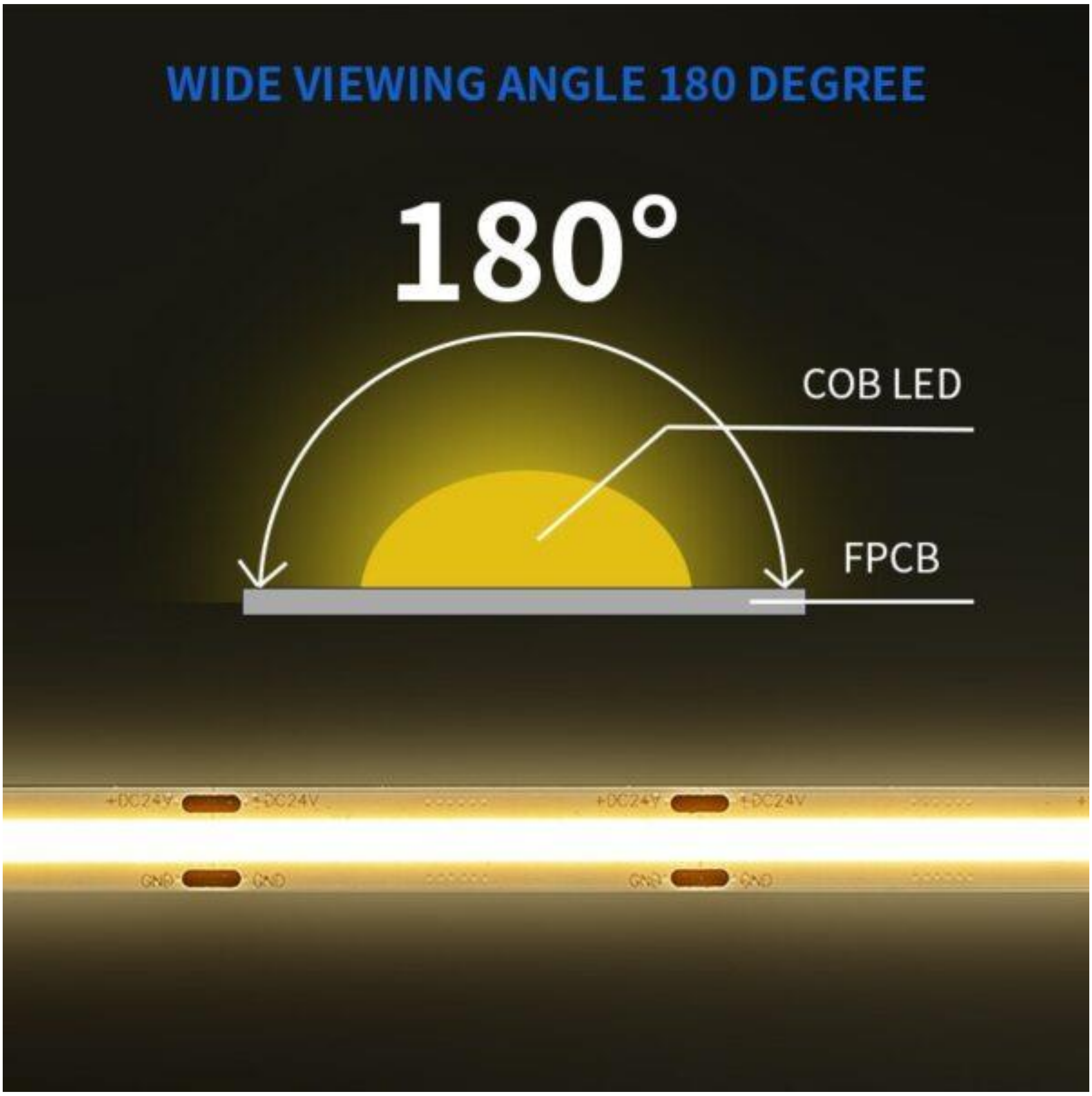
2. The circuit design of the COB strip uses three chips, first in parallel, as a group, then each group, and then in series to form one step. Even if a group of two chips inside the bad, this one-step strip can continue to light. And COB a meter of chips how big 480, even if 1-2 chips do not light, will not produce dark areas, will not affect the use. While the traditional SMD strip, a CUT, as long as there are lousy lamp beads, this one cut will not light, so there will be obvious to see a section of the dark area.





Wide emitting angle

The traditional SMD light strip luminous angle is 120 degrees, while the COB light strip luminous angle is 180 degrees.



Anti-vulcanization

Because COB LED strips, chip on board, do not have the gold wires of traditional SMD LEDs, so they will not be vulcanized. In the chip inside the SMD LED lamp bead, one electrode is connected to the LED bracket with gold wire, and the other electrode is connected to the bracket through silver glue. But silver reacts very easily with sulfides to form silver sulfide. As a result, the blackening and luminous flux of the LED are reduced.

Stronger anti-static capability

COB LED strips have stronger antistatic ability than traditional SMD LED strips.

Disadvantage:

Difficult to maintain the consistency of color

Because there is no COB led strips binning machines on the market. At present, all COB led strips manufacturers are only sampling to ensure color consistency. So, COB led strips are difficult to ensure that 100% are within the 3-step color tolerance.

Lower luminous efficiency

COB led strip light efficiency, currently only about 120LM/W. If you need higher light efficiency, COB led strip is not suitable.

Lower power

The maximum power of COB led strip, only recommended doing 15W / m. Because the number of chips per meter is too much, if the power exceeds 15W / m, the chip's heat is brutal to dissipate. COB led strip life will be shortened.

Characteristics of COB Flex Strips

If you've been listening, the advantages and disadvantages of COB flexible light strips should be obvious, so now let's get into some specific details about this sort of strip. If you're acquainted with LED strips, then lots of this may sound familiar, but there are some differences during this form of strip, so it's best to test out the guidelines below before using COB strips.

Cut and Connect

COB led strip can cut this strip just like our other strip lights. Please only cut along the cut marks marked on the strip every 50mm (24) / 25mm (12V). This allows you to cut the strip to a custom size or add gaps to your application. The cut strips can be used again and are best connected by soldering, but if this is often not an option, our COB strip connectors also are available as an option.

Dimmable

Flexible COB led strips are dimmable as well as regular SMD led strips. You can use DALI, triac, PWM, 0-10V dimming power supply to use with COB led strips to achieve dimming.

Color Options

White light: 2700K, 3000K, 4000K, 6000K, and other custom color temperatures are available

Colorful light: Red, green, blue, yellow, pink, etc., are available.

Tunable white, RGB, RGBW are all available.

Mono cob led strip

CCT cob led strip

RGB cob led strip

RGBW cob led strip

addressable cob led strip

Voltage Options

5V(volt) cob led strip light

12V(volt) cob led strip light

24V(volt) cob led strip light

48V(volt) cob led strip light

Length Options

5m cob led strip

10m cob led strip

50m cob led strip

100m cob led strip

COB LED Strip Sample Book



Ultimate Guide To Aluminum Profile For LED Strip

LED strip lights are growing in popularity due to their energy efficiency and versatility. There are various ways to install LED strip lights, but one of the most popular is using aluminum profiles. This guide will provide an overview of aluminum profiles for LED strip lighting, including their benefits, types, and installation tips.

What is an LED aluminum profile?

LED aluminum profiles, also known as aluminum extrusions, are structures typically made of aluminum designed to house and protect LED strip lights. Most importantly, it can help the LED strip to dissipate heat quickly.

LED aluminum profiles are becoming popular for both commercial and residential properties. There are many benefits of using LED aluminum profiles. For example, LED aluminum profiles can help the LED strip to have a longer service life. In addition, it is more durable than conventional lighting fixtures and can withstand the harsh environments in which many LED lights are used, such as retail shops and restaurants.



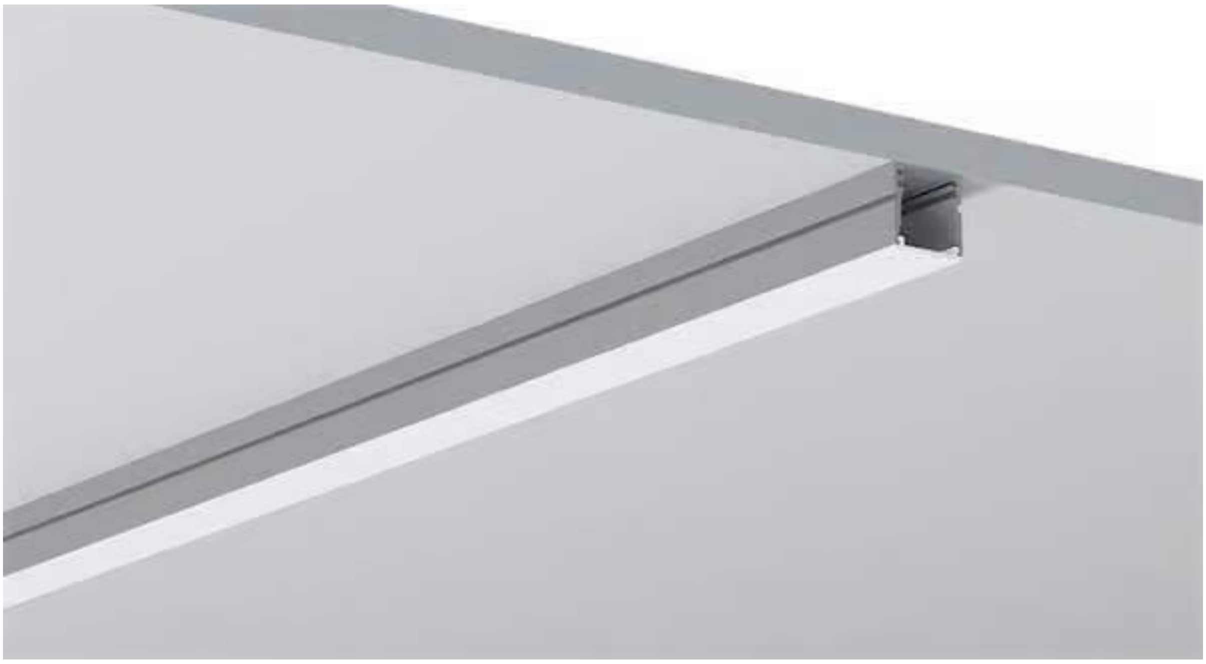
What are the common LED aluminum profiles?

LED aluminum profiles have become so ubiquitous that finding them in new and existing buildings is no longer a novelty. However, they are not all the same. Here are the most common types of aluminum profiles:

1. Surface mounted LED aluminum profile

A surface mount LED aluminum profile, also known as a U-shaped LED channel, is the most common one. They are effortless to install by installing mounting clips.

Surface-mounted LED aluminum profiles can be installed on various surfaces such as under cabinets, ceilings, wardrobes, and more.



2. Recessed mounted LED aluminum profile

The recessed LED aluminum profile, also known as the T-shaped LED aluminum profile, is recessed inside the surface. We usually use these channels on wood shelves or cabinets.

To install the recessed LED aluminum channel, you must open the corresponding slot according to the size of the channel.



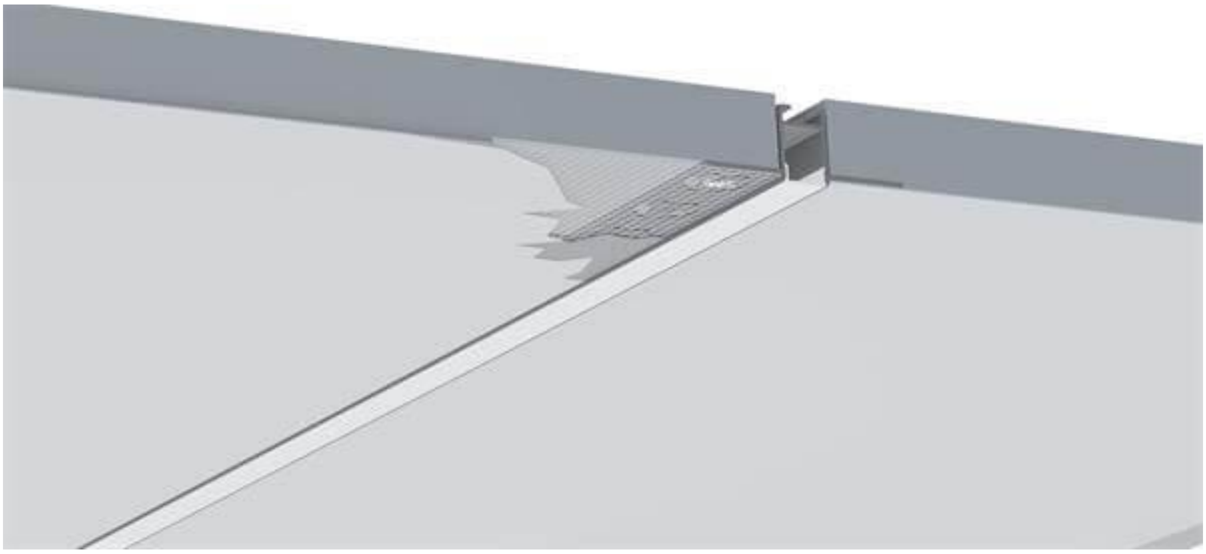
3. Corner LED aluminum profile

The Corner LED aluminum profile has an angle and is generally used to install on the corners of walls, ceilings, shelves, cabinets, and stairs. Its installation method is similar to surface-mounted LED aluminum profiles, using mounting clips.



4. Drywall LED aluminum profile

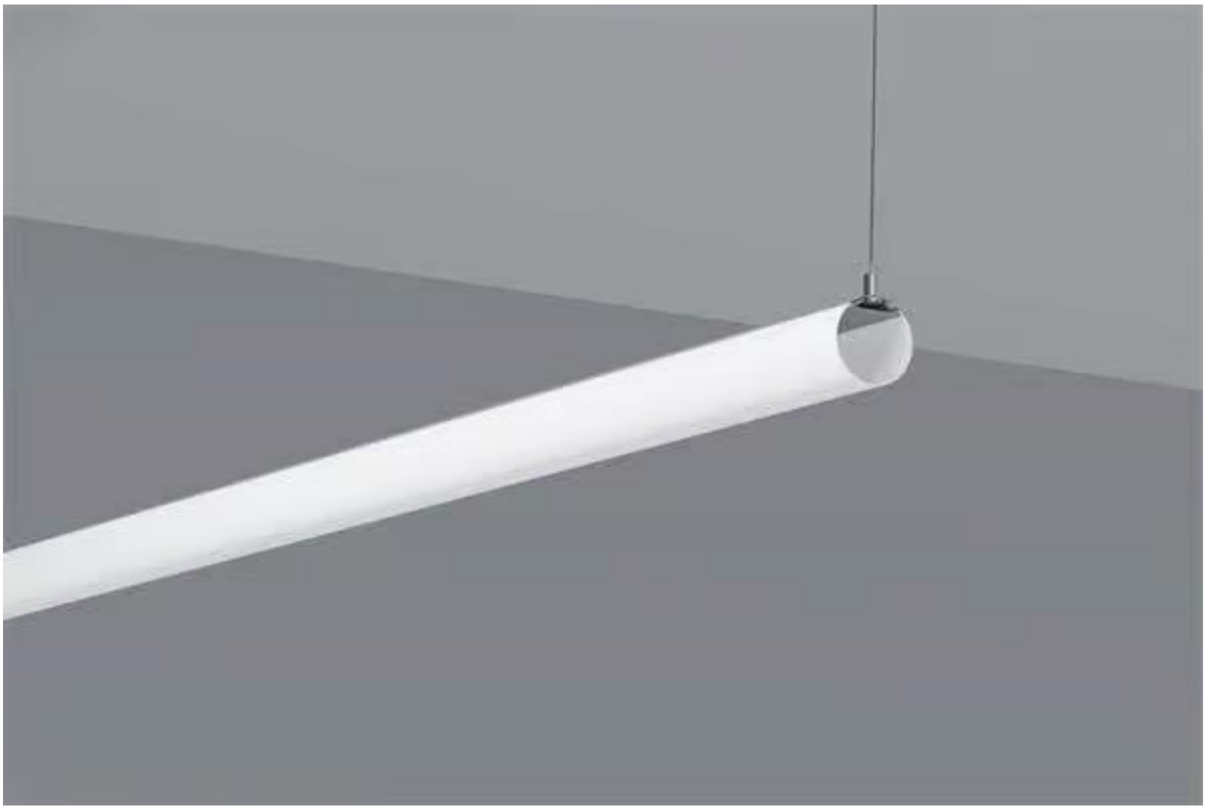
The drywall LED aluminum profile offers a more concise effect, as this type of LED channel hides all the wires and LED strips on the wall. However, this installation is complicated and may require professional installation and careful planning. These are common in shops, stores, and other commercial spaces with drywall ceilings.



5. Suspended LED aluminum profile

Using stainless steel ropes, suspended LED aluminum profiles are suspended from the ceiling. These aluminum profiles are used in places with high ceil ings.

Hanging LED aluminum profiles are becoming increasingly popular now, as man y designers use them to make various attractive shapes.



6. Ring Circular LED aluminum profile

Ring Circular LED extrusions are designed to be circular. Usually, these LED profiles are suspended from the ceiling. These aluminum materials are decorative, functional, and generally used in commercial places and homes.

It can be customized to different diameters. Lighting direction can also be up, down, inside, and outside.



7. Wardrobe rail LED aluminum profile

Wardrobe rail LED aluminum profile, used in the wardrobe, can be used not only for lighting but also as a clothes hanger.

These usually have an oval shape and have the diffuser at the bottom of the rod.



8. Flexible LED aluminum profile

Flexible LED aluminum profiles are made of thin and light aluminum. It can be easily bent by hand. It is perfect for mounting on curved surfaces.



9. IP65 waterproof LED aluminum profile

Waterproof LED aluminum profiles are mainly suitable for outdoor use. The difference between waterproof LED aluminum and others is because of the PC tube. We installed the LED strip into the PC tube and sealed it with an endcap and silicone glue.



10. Floor LED aluminum profile

The floor LED aluminum profile is installed into the ground and is waterproof. It’s very durable because people might step on it. It can be functional and decorative. For example, ground LED channels can be used to indicate emergency exits.



11. Wall LED aluminum profile

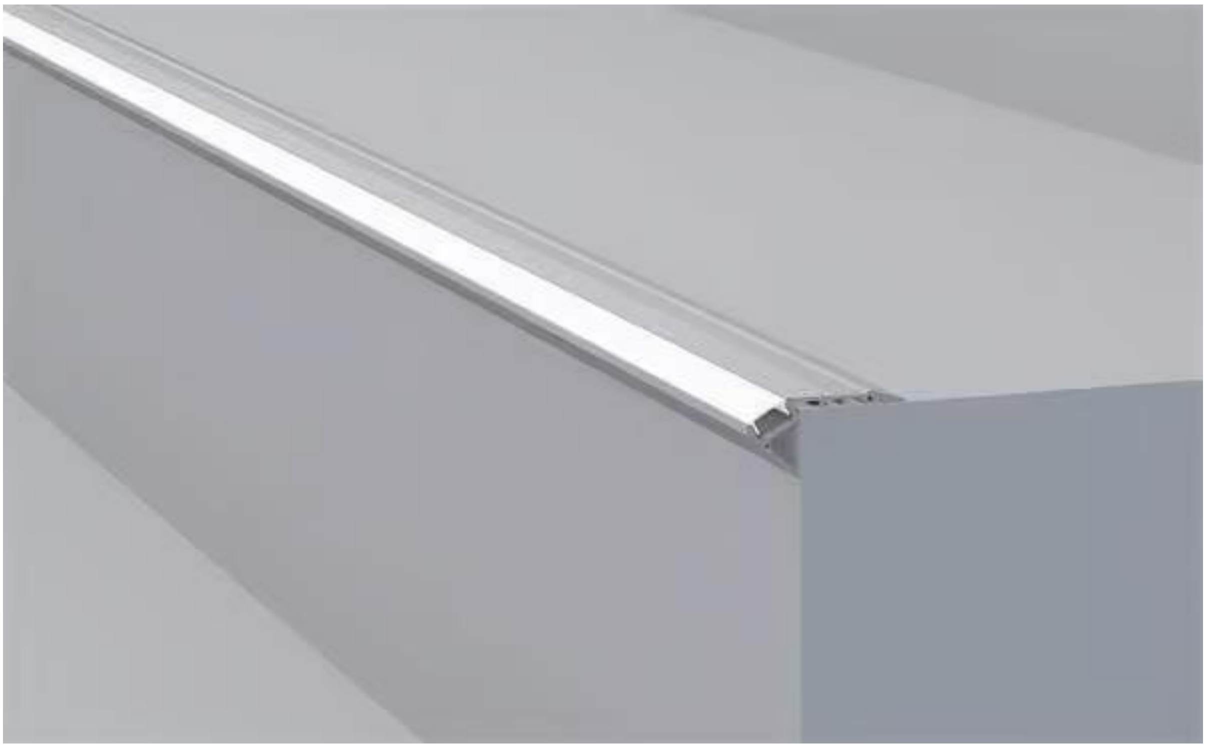
Wall LED aluminum profile is mounted on the wall for indirect lighting. It illuminates the passageway, making it easier for people to walk without tripping.



wall led aluminum profile

12. Stair LED aluminum profile

These LED extrusions are installed on the stairs, which is convenient for people to walk in a relatively dark lighting environment. It is widely used in cinemas and can also be used for commercial lighting and home lighting.



13. Optic Lens LED aluminum profile

The most significant difference between the optic lens LED aluminum profile and others are that its diffuser is not flat. Its diffuser can change the l ighting angle of the LED strip inside. These aluminum channels can be used when a narrower beam angle is required.



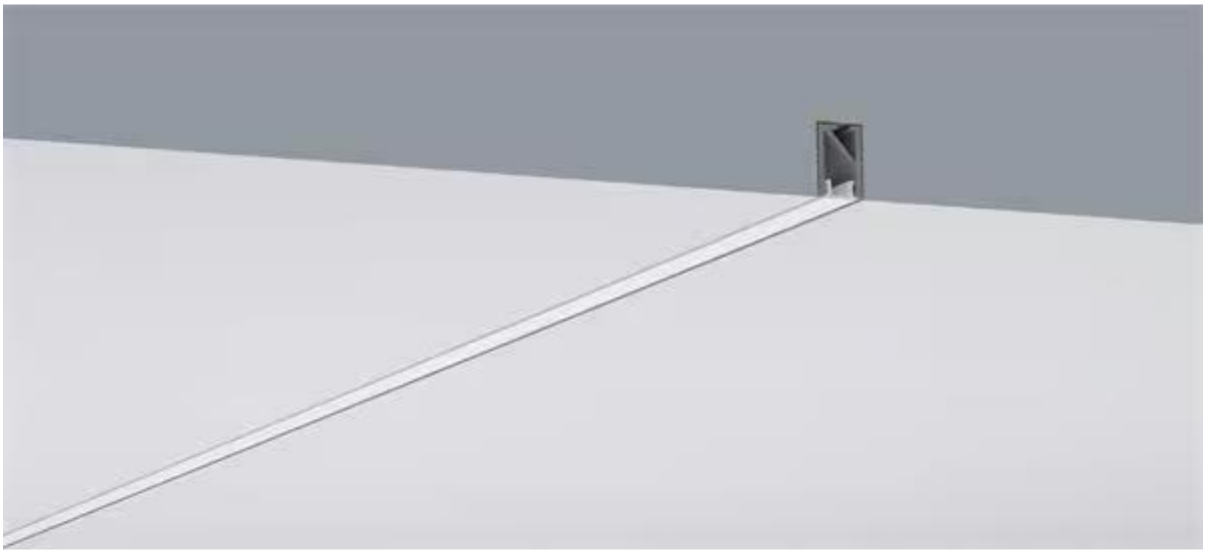
14. Glass shelf LED aluminum profile

Glass shelf LED aluminum profiles to illuminate the glass mounted on it. I t' s similar to surface-mounted aluminum channels, except it doesn' t have a diffuser, and the glass is installed into it. It is mainly decorative and is usually used with color-changing LED strips.



15. Mini LED aluminum profile

These LED aluminum profiles are very small, and the width inside may only be 3MM, 4MM, 5MM, etc. This LED aluminum is required to be used with our ultra-narrow LED strips.



What types of diffusers are available for LED aluminum profiles?

There are so many types of diffusers. How do I know which one is right for me?

There are two primary materials for diffusers on the market, PC and PMMA.

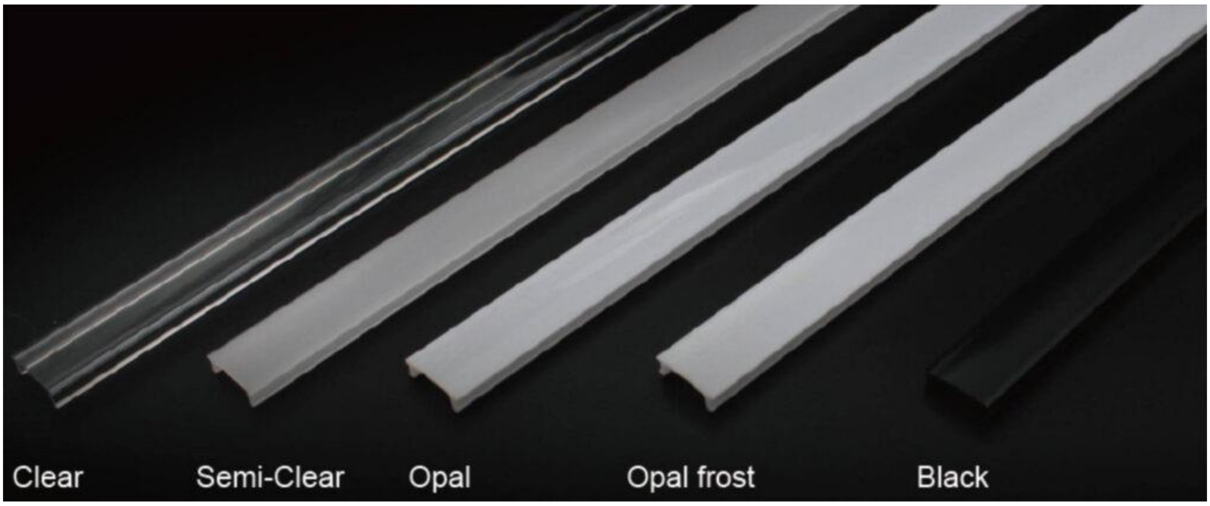
PC diffuser

Pros	Cons
• Impact resistant. • Flame retardant materials, not easy to burn. • Environmentally friendly plastics. • UV resistant. • Weather resistance (outdoor aging resistance).	• Low surface hardness. • Easy to scratch.

PMMW diffuser

Pros	Cons
• Good transparency. • The surface has good scratch resistance.	• Large wear coefficient. • Larger tendency of high temperature thermal deformation. • Easy to crack.

The light transmittance of the different diffusers is different. Choose a suitable diffuser according to the lighting effect you want.



Transparent diffuser

85-95% light transmittance. For maximum brightness, this diffuser will not provide spotless light effects.

Semi-Clear diffuser

70-80% light transmittance.

Opal diffuser

70-80% light transmittance. It can minimize the light spot and diffuser the light evenly

Black diffuser

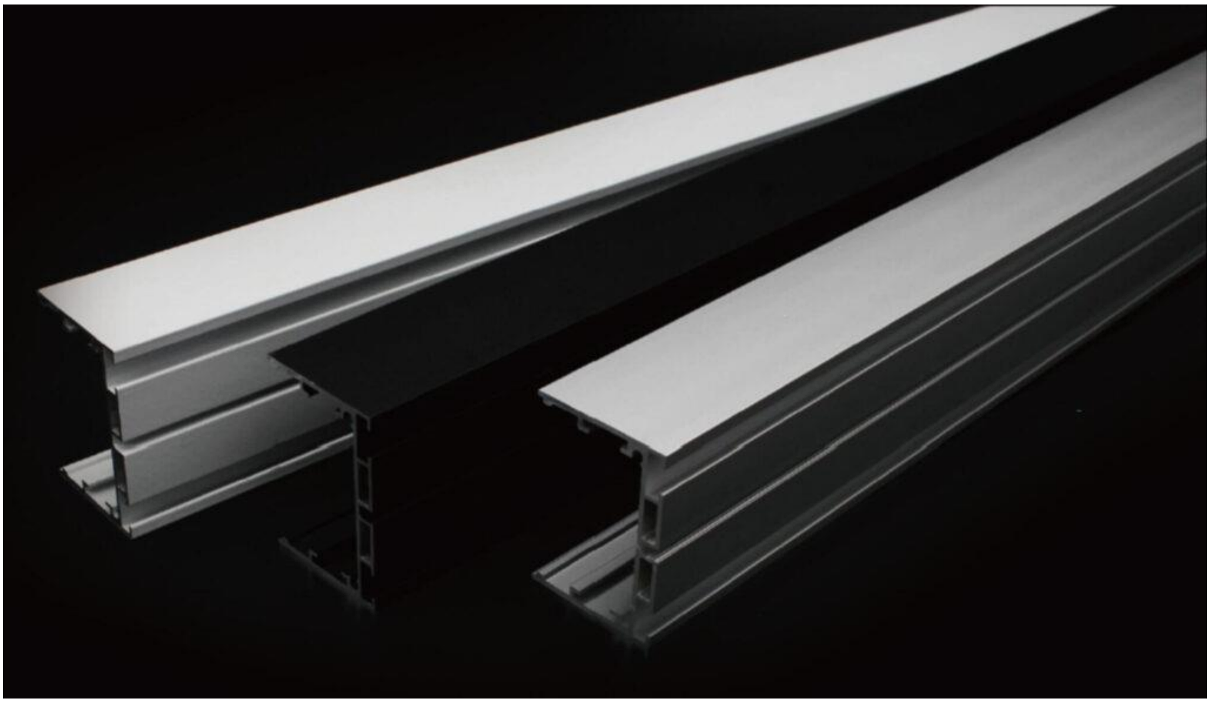
30-35% light transmittance. Just like the opal diffuser, it’s decorative, as the led strip is not

visible. As the transmittance rate is low, you may need a brighter led strip to increase the brightness.

What finishes are available for the LED channel?

Most of the aluminum LED channels are anodized. Anodizing is an electrochemical process anodizing layer that makes it corrosion resistant, durable, and decorative. Other finishes include powder coating, paint, and gloss dipping, all used for protection and decorative purposes.

Three standard anodized finishes in LED aluminum profiles are silver anodized, white anodized, and black anodized.



What parts does an LED aluminum profile contain?

The LED aluminum profile system is not only composed of aluminum, and it includes the following parts.



Heat sink(Aluminum extrusion)

The heat sink is an essential part of the LED aluminum profile system. Its material is 6063-T5 aluminum, which can help the LED strip to dissipate hea t quickly.

Diffuser

Diffuser’s material is generally PC or PMMA. The diffuser covers the LED s trip to protect the LED strip and diffuse the light.

End caps

Most Endcaps are made of plastic, and a few are made of aluminum. It is gen erally divided into with-holes and without-holes. The endcap with holes is for the wires of the LED strip to pass through.

Suspension cable

When installing LED aluminum profiles, you need to use a hanging cable. The material of the hanging rope is generally stainless steel.

Mounting clips

Most materials for mounting clips are stainless steel, and some are plastic.

Mounting clips are generally used to mount surface or angle mount aluminum channels.

Other accessories

And there are some other accessories, such as rotating brackets, suspension brackets, and connectors.

Why Choose an LED aluminum profile?

The LED aluminum profile looks beautiful, but it will increase the cost. Choosing an LED aluminum profile with an LED light strip will have the following benefits.



Enriches the lighting effect

Choosing a suitable diffuser, such as an opal diffuser, allows the light to be uniform, without lighting spots.

Protects LED strip lights

If you leave the LED strips exposed, they are vulnerable to damage from the outside environment. Even if it’s waterproof, it won’t last long outside the LED channel. So the LED track protects the LED tape inside from dust, water, and other external elements. Also, the LED tape itself doesn’t look aesthetically pleasing. But the LED strips installed on the profiles look very modern and stylish.

Enhances heat dissipation

LED strips generate heat when they work. If the heat is not dissipated in time, it will shorten the life of the LED strip.

The LED aluminum profile’s primary material is aluminum, which has excellent heat dissipation. Therefore, the LED aluminum profile can help the LED strip to dissipate heat faster and ensure that the working temperature of the LED strip is within the normal range.

Easy to form different shapes

You can cut LED aluminum profiles into different shapes, such as L-shape, T-shape, etc. Then stick the LED light strips into the aluminum profiles to make various shapes of lighting effects.

Easy installation

Installing aluminum LED profiles is very easy. One person can easily do this. You can cut them to the length you want, making them ideal for custom lighting setups. You need to drill the mounting clips and screw channels. It doesn’t require a lot of tools, and it doesn’t take much time. You can also use them to get lighting in places that may not have electrical connections to install lights.

Easy to clean

Because the LED strip is covered with a diffuser, you can easily clean it without worrying about damaging the LED strip.

Various applications of LED aluminum profiles

LED strip aluminum profile is becoming more and more popular, and it can be used in many occasions.

Cove lighting



Kitchen lighting



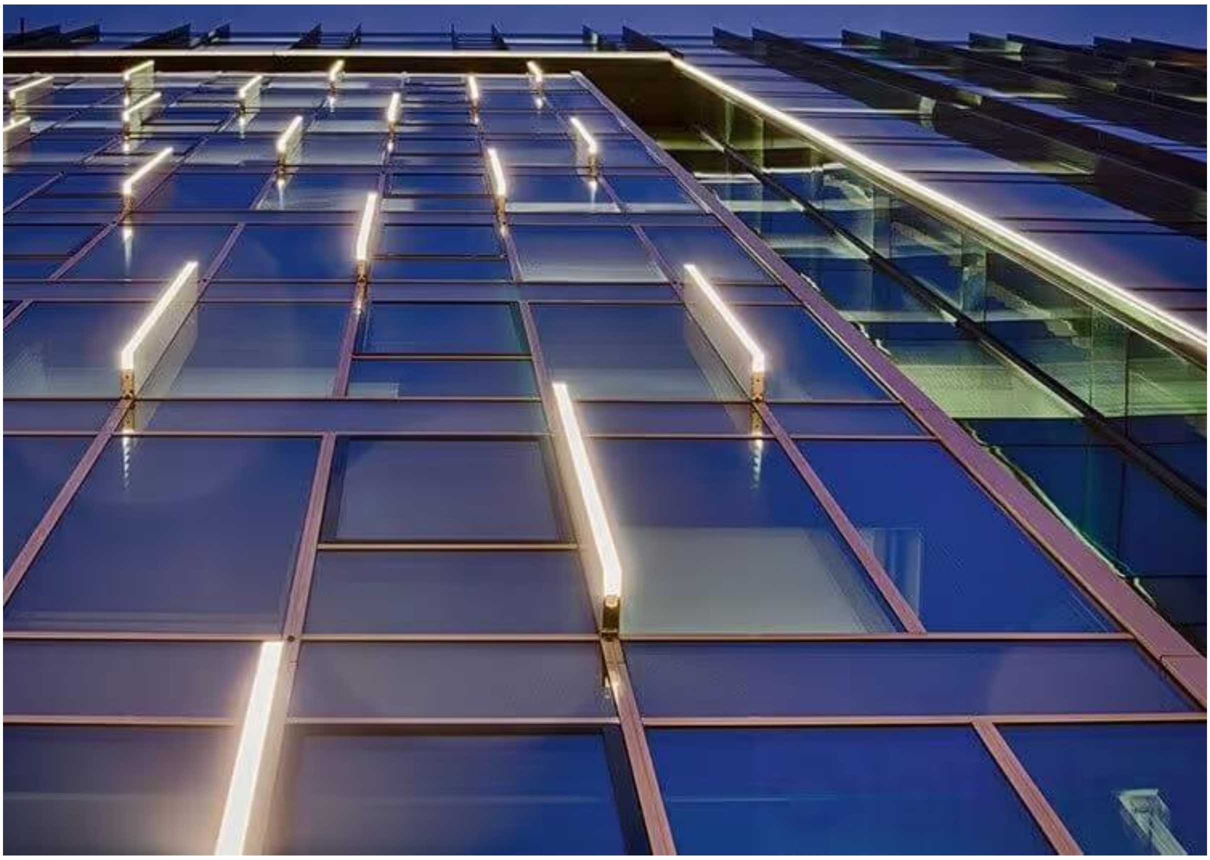
Gate and entrance lighting



Garden lighting



Facade lighting



Bathroom lighting



Advertisement lighting



Cabinet lighting



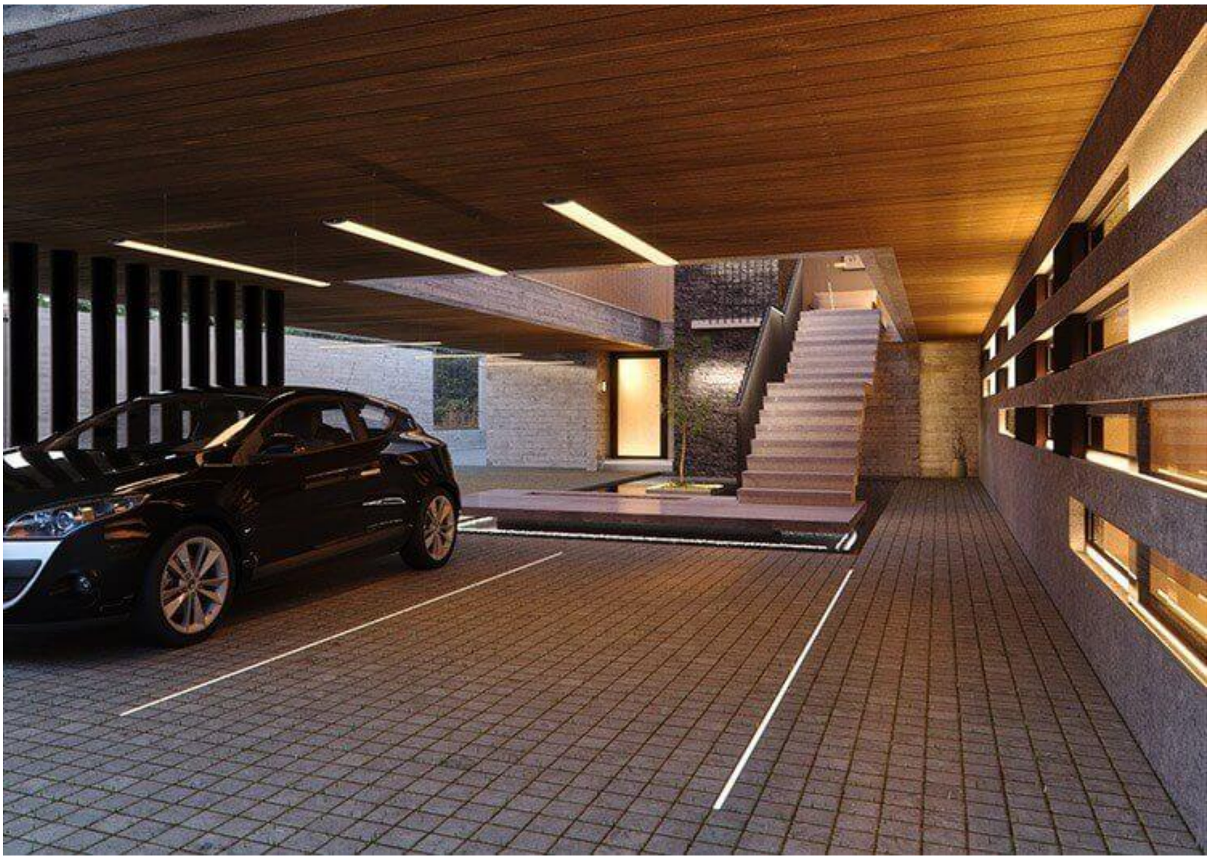
Wall and ceiling lighting



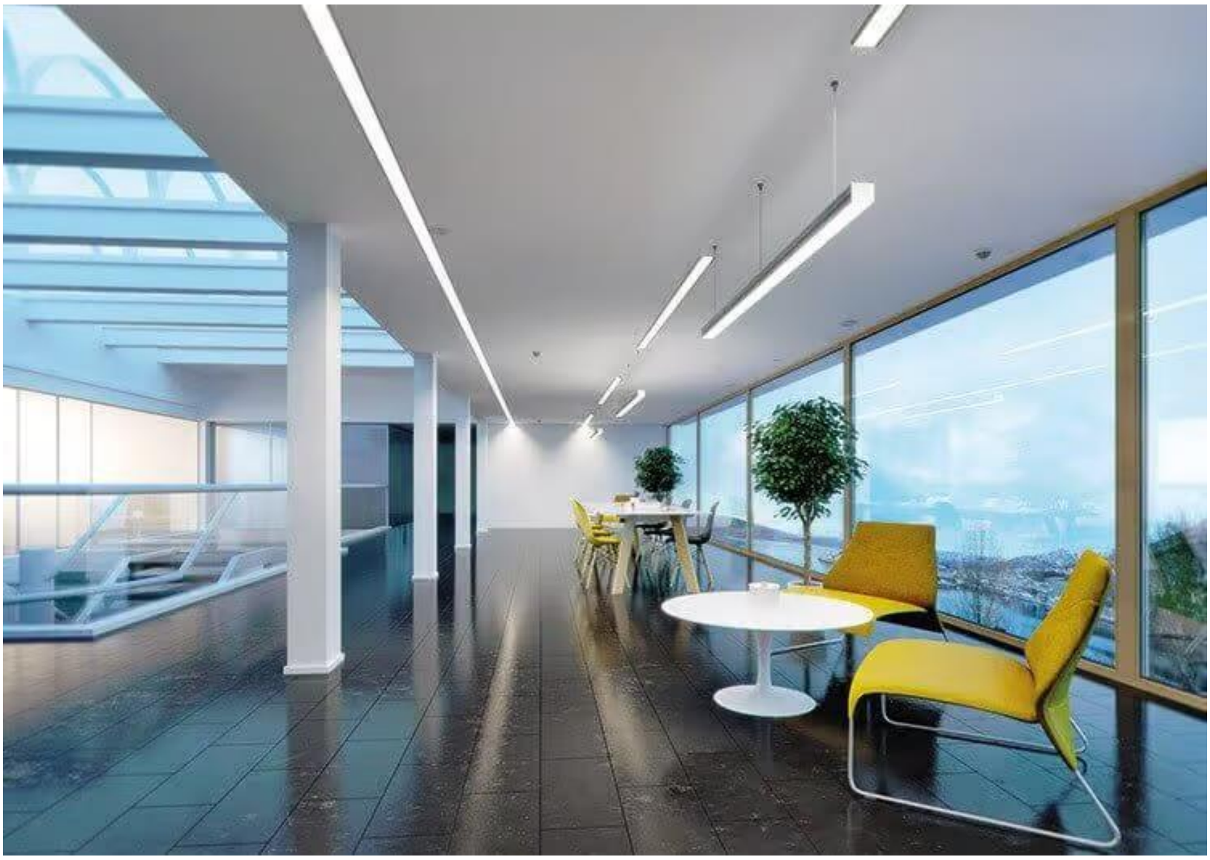
Stairs and handrails lighting



Parking and garage lighting



Office lighting



How to select an LED aluminum profile for LED strip lights?

It is essential to consider several important things before buying LED aluminum profiles.

Dimensions of LED strip lights

First thing, you need to confirm the size of the LED strip. The width of the LED strip is the most critical, and you must ensure that the width inside the LED aluminum profile is larger than the width of the LED strip.

Then buy enough aluminum channels according to the length of the LED strip.

The lighting effect you want to achieve

Which type of diffuser to buy is determined by the lighting effects you want. If it is direct lighting, and you need the light to be spotless, then you need to choose an opal diffuser.

If indirect lighting and high brightness are essential, you will most likely want to choose a transparent diffuser.

Suppose you are installing LED profiles for decorative purposes only. In that case, you may consider recessed, or plaster LED channels, as they blend in perfectly with the environment and look tidier.

Location of installation

You need to consider the mounting position of the LED aluminum profile. If it needs to be installed outdoors, then you need to choose an IP65 waterproof aluminum profile.

For corner lighting, then you need to choose the corner aluminum profile.

For cabinet lighting, then recessed aluminum profile is a good choice.

Mounting type

Finally, consider how you want to mount the LED channel. Do you have a concave surface?

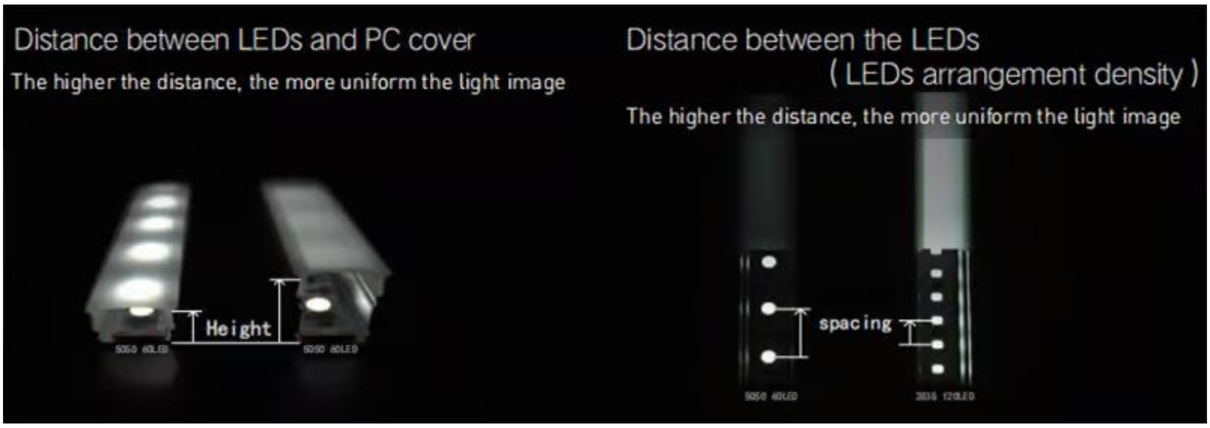
Do you have gypsum board ceilings? Or do you want the most effortless installation possible?

These questions will help you determine which type of LED channel is best for your needs.

What factors can affect the light spot?

People are most concerned about the light spots when using LED aluminum profiles.

In practice, the following factors affect the light spot.



Diffuser light transmittance

Diffusers with low light transmittance, such as opal diffusers, can eliminate light spots as much as possible.

Distance between LEDs and diffuser

The farther the LED is from the diffuser, the less noticeable the light spot will be.

LEDs density

The greater the density of the lamp beads of the LED strip, the less noticeable the light spot.

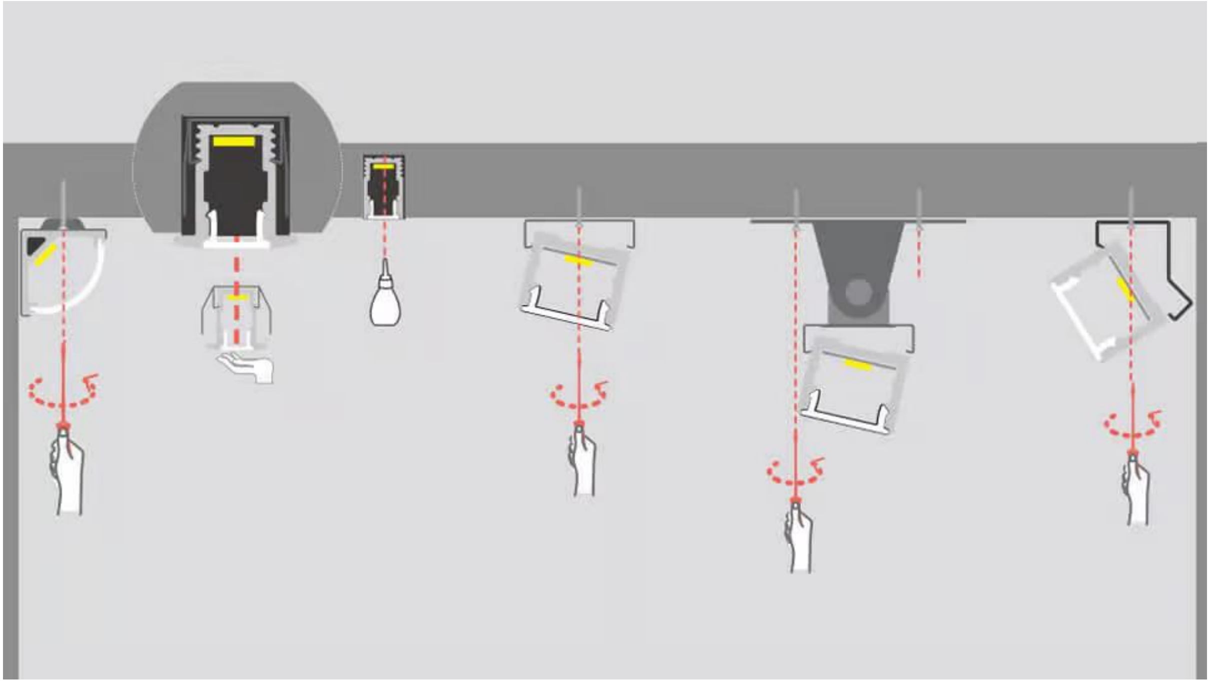
Now the latest technology COB LED strips use chips to be directly attached to the PCB, and the density exceeds 500 chips per meter. Even without a diffuser, COB LED strips will not have lighting dots.

How To Install LED Aluminum Profile

The installation of the LED aluminum profile includes three steps. Install the aluminum profile, install the LED strip into the aluminum profile, and install the aluminum profile cover. The order of these three steps varies depending on the type of installation. I will explain the detailed installation steps step by step below.

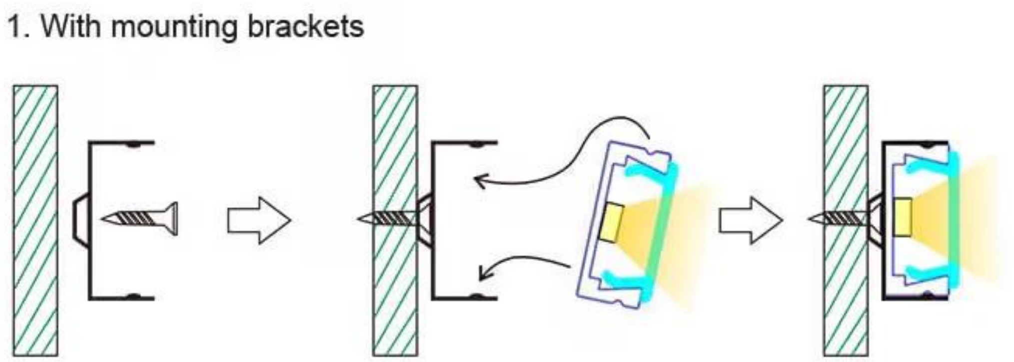
Step 1: Mount the LED aluminum profile.

LED aluminum profiles are easy to install due to their lightweight. Depending on the shape and function of the LED aluminum profiles, they can be surface mounted, recessed or flush-mounted, corner mounted, or suspended. LED profiles are usually mounted using mounting brackets, screws, 3M double-sided tape or mounting adhesive, suspension cables, and fasteners.

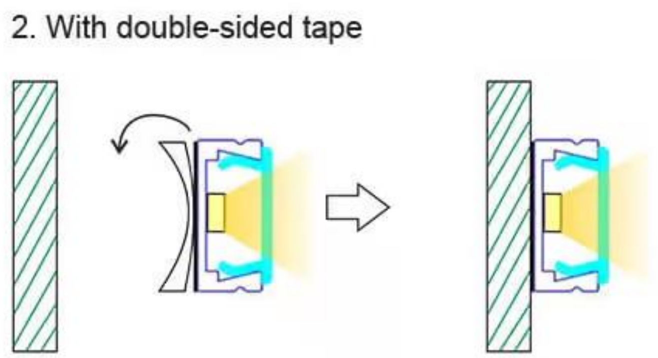


Surface mount aluminum profile

You can mount the LED strip light channel directly on a wall, ceiling, or other surface using mounting brackets, 3M double-sided tape, or screws. Mounting brackets usually have pre-drilled holes. You can quickly fix them on the wall with screws. Then, the aluminum profile snaps into the mounting brackets.



Installing an LED strip light channel with 3M double-sided tape is as easy as peeling and sticking. This installation requires the preparation of the mounting surface and ensuring it is clean and dry. Use isopropyl alcohol as a cleaning solvent and use acetone instead for the oily substrate.



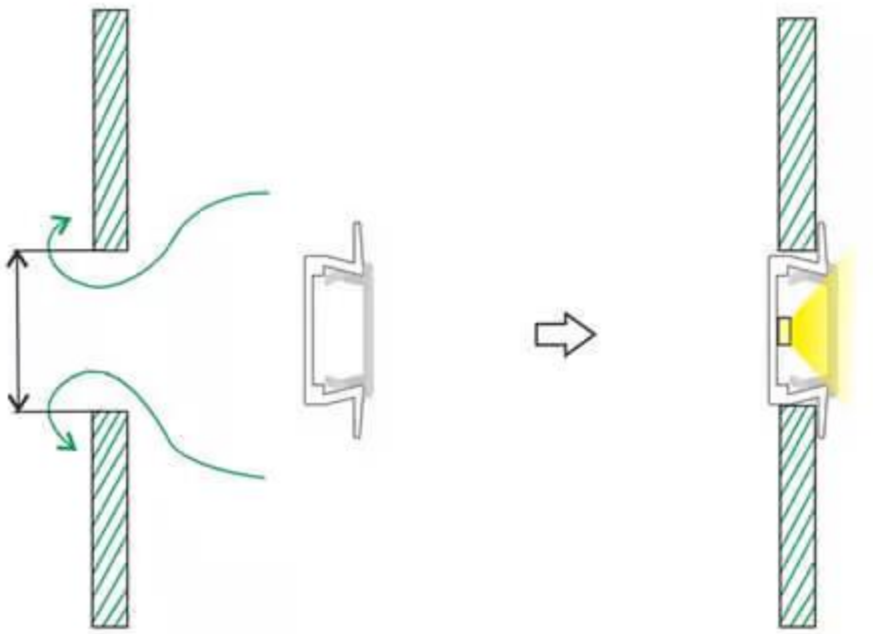
Since the LED profile is made of aluminum, it is also easy to penetrate wit h a screw so that the aluminum profile can be easily fixed to the mounting surface.

Recessed mount or flush mount aluminum profile

The aluminum profile is mounted behind a wall or other surface with the con toured opening flush with the surface. It would be best if you dug a recess in the mounting area to match the width and depth of the LED strip channel.

Are you worried about the recess opening being uneven or too wide? Don't w orry. LED aluminum channel tracks with lips (also known as wings or flange s) on both sides. When flush-mounted, they can overlap unpleasant recess ed ges or gaps.

Some LED aluminum profiles have two recesses in the side walls. Use the mounting clips to clamp onto the first or second recess to adjust the mounting height and the cooling distance between the LED profile and the recess base on the mounting surface.



Corner mount aluminum profile

The angle LED aluminum channel is used as an angle mounting substrate for LED strips, providing beam angles of 30°, 45°, and 60° concerning the mounting surface and creating ambiance in the corner areas of the room. Corner mounting is made easy by using mounting brackets, double-sided adhesive tape, etc.
For corner mounting, the LED aluminum channel makes good use of space unavailable to other luminaires. In addition, special attention needs to be paid to dark corners when designing lighting schemes. Corner-mounted LED profiles easily brighten up corners stylishly and elegantly. Where does the high thermal performance of corner-mounted LED profiles come from? Let's take the example of the 45° beam angle LED profile. The corner-mounted profile has an internal base at a 45° angle to the two walls of the profile. The inner base and the two walls of the LED channel form a cavity which enhances the cooling of the LED strip and the cooling of the channel.



Suspended mount led aluminum extrusion profile

LED extrusion profiles have been more and more used in elegant strip lighting for modern spaces. Hanging the LED extrusion profile from the ceiling is a new way to create contemporary lighting in the air. Pendant cables, buckles, and fasteners are usually used to hang the LED profiles.



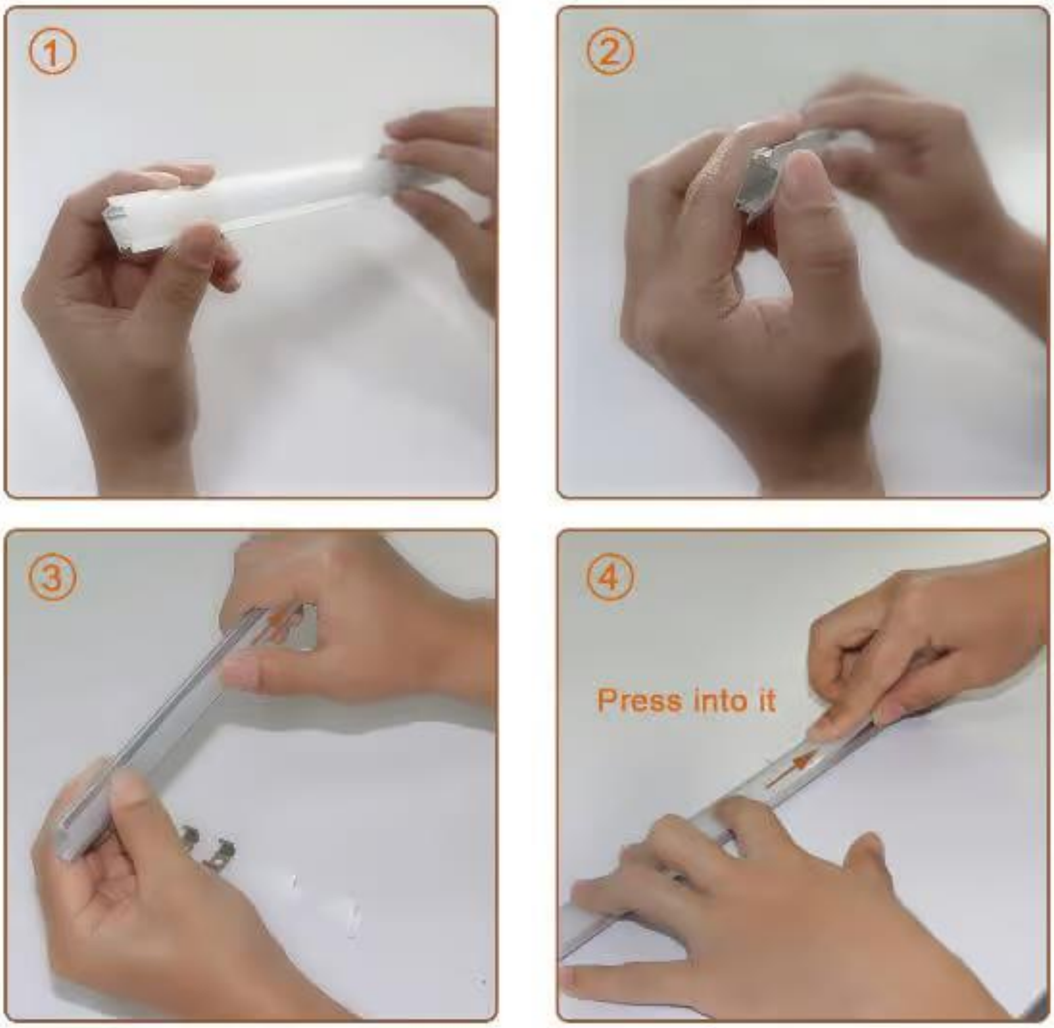
Step 2: Install LED strip lights into the LED extrusion profile.

This is the typical peel-and-stick installation. Peel off the protection liner of the 3M double-sided tape and stick the LED strip to the inner base of the aluminum channel.

Step 3: Pair the LED aluminum channel with cover.

Line the cover with the LED aluminum channel at one end, and squeeze the cover into the holding grooves on the inner walls of the channel. Then press to the other end. You can tell by the click sound if the cover sits in the position.

Line up the cover with the aluminum channel, squeeze one end of the cover into the channel, then press all the way to the other end.



LED aluminum profile VS COB LED strips

Regarding LED linear lighting, we will also consider COB LED strips in addition to LED aluminum profiles. Both aluminum profiles and COB light strips allow spot-free lighting from LED lights. What is the difference between them?

COB LED strip has a linear lighting effect due to high-density chips, so no additional diffuser is required. The COB LED tape is adhesively mounted and available in waterproof and non-waterproof options for indoor and outdoor use.

However, aluminum profiles are different. As an LED strip accessory, the aluminum profile can protect the LED strip and help dissipate heat quickly.

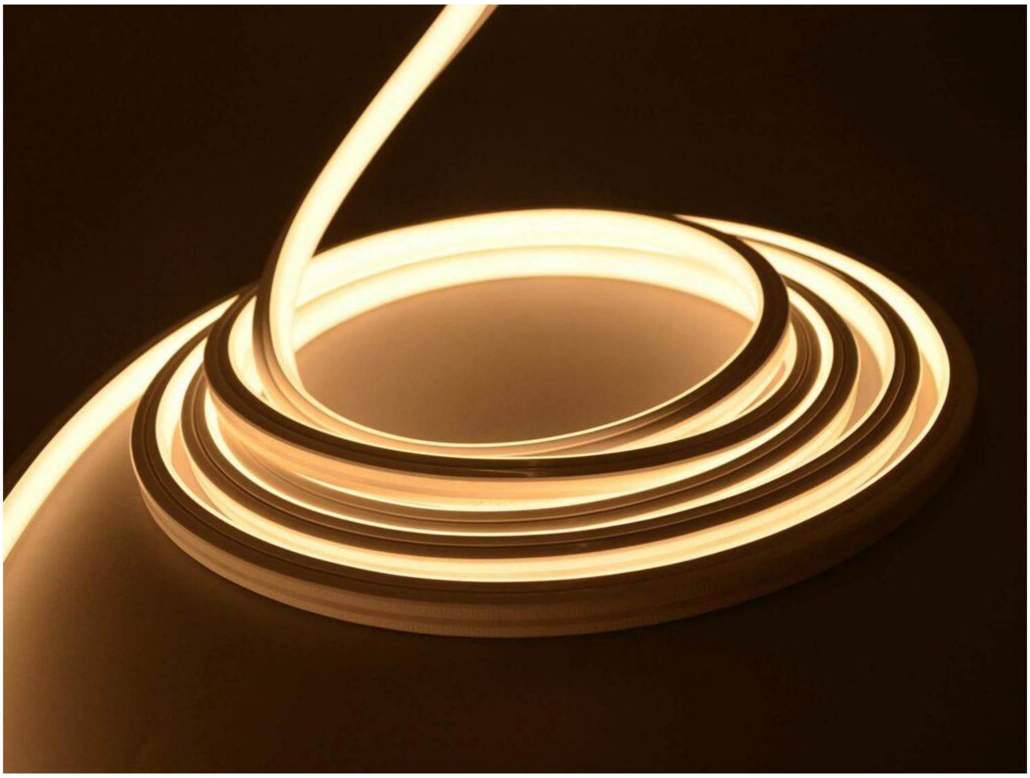
Aluminum profiles are rigid and not easy to bend, while COB strips are flexible and can bend easily.

The IP20 non-waterproof COB strip is exposed to the air on the PCB board, and the installation environment impacts the COB strip more. Overheating of COB strips can significantly reduce strip life. Adding an aluminum channel LED strip light dissipates heat and has a more beautiful installation effect.



LED aluminum profile VS LED neon flex

Both [neon flex lights] and LED aluminum profiles can achieve no light spot effect. However, neon light is more flexible, bendable, and is IP67, widely used in outdoor decorative lighting.



Aluminum Profile Extrusion Process

The use of aluminum extrusion in product design and manufacturing has increased significantly in recent decades. Today we' ll discuss what aluminum extrusion is, the benefits it offers, and the steps involved in the extrusion process.

What is Aluminum Extrusion?

Aluminum extrusion is when aluminum alloy material is forced through a die with a specific cross-sectional profile.
A powerful ram pushes the aluminum through the die, and it emerges from the die opening. When it does, it comes out in the same shape as the die and is pulled out along a runout table. At a fundamental level, aluminum extrusion is relatively simple to understand. The force applied can be likened to the force you apply when squeezing a tube of toothpaste with your fingers.
As you squeeze, the toothpaste emerges in the shape of the tube' s opening. The opening of the toothpaste tube essentially serves the same function as an extrusion die. Since the opening is a solid circle, the toothpaste will come out as a long solid extrusion.



Aluminum extrusion can be likened to squeezing toothpaste from a tube

The Aluminum Extrusion Process in 10 Steps

We' ve divided the extrusion process into ten steps. Let' s take a look at what they are.

Step #1: The Extrusion Die is Prepared and Moved to the Extrusion Press

First, a round-shaped die is machined from H13 steel. Or, if one is already available, it is pulled from a warehouse like the one you see here.Before extrusion, the die must be preheated to between 450-500 degrees celsius to help maximize its life and ensure even metal flow. Once the die has been preheated, it can be loaded into the extrusion press.

Step #2: An Aluminum Billet is Preheated Before Extrusion

Next, a solid, cylindrical block of aluminum alloy, called a billet, is cut from a longer log of alloy material. It is preheated in an oven, like this one, to between 400-500 degrees celsius. This makes it malleable enough for the extrusion process but not molten.

Step #3: The Billet is Transferred to the Extrusion Press

Once the billet has been preheated, it is transferred mechanically to the extrusion press. mBefore it is loaded onto the press, a lubricant (or release agent) is applied to it. The release agent is also applied to the extrusion ram, to prevent the billet and ram from sticking together.

Step #4: The Ram Pushes the Billet Material into the Container

Now, the malleable billet is loaded into the extrusion press, where the hydraulic ram applies up to 15,000 tons of pressure to it. As the ram applies pressure, the billet material is pushed into the container of the extrusion press. The material expands to fill the walls of the container.

Step #5: The Extruded Material Emerges Through the Die

As the alloy material fills the container, it is now being pressed up against the extrusion die. With continual pressure being applied to it, the aluminum material has nowhere to go except out through the opening(s) in the die. It emerges from the die’s opening in the shape of a fully-formed profile.

Step #6: Extrusions are Guided Along the Runout Table and Quenched

After emerging, the extrusion is gripped by a puller, like the one you see here, which guides it along the runout table at a speed that matches its exit from the press. As it moves along the runout table, the profile is “quenched,” or uniformly cooled by a water bath or by fans above the table.

Step #7: Extrusions are Sheared to Table Length

Once an extrusion reaches its full table length, it is sheared by a hot saw to separate it from the extrusion process. At every step of the process, temperature plays an important role. Although the extrusion was quenched after exiting the press, it has not yet fully cooled.

Step #8: Extrusions are Cooled to Room Temperature

After shearing, table-length extrusions are mechanically transferred from the runout table to a cooling table, like the one you see here. The profiles will remain there until they reach room temperature. Once they do, they will need to be stretched.

Step #9: Extrusions are Moved to the Stretcher and Stretched into Alignment

Some natural twisting has occurred in the profiles and this needs to be corrected. To correct this, they are moved to a stretcher. Each profile is mechanically gripped on both ends and pulled until it is fully straight and has been brought into specification.

Step #10: Extrusions are Moved to the Finish Saw and Cut to Length

With the table-length extrusions now straight and fully work-hardened, they are transferred to the saw table. Here, they are sawed to pre-specified lengths, generally between 8 and 21 feet long. At this point, the properties of the extrusions match the T4 temper. After sawing, they can be moved to an aging oven to be aged to the T5 or T6 temper.

What Happens Next? Heat Treatment, Finishing, and Fabrication

Once extrusion is completed, profiles can be heat treated to enhance their properties. Then, after heat treatment, they can receive various surface finishes to enhance their appearance and corrosion protection. They can also undergo fabrication operations to bring them to their final dimensions

Heat Treatment: Improving Mechanical Properties

Alloys in the 2000, 6000, and 7000 series can be heat treated to enhance their ultimate tensile strength and yield stress.
To achieve these enhancements, profiles are put into ovens where their aging process is accelerated and they are brought to the T5 or T6 tempers. How do their properties change? As an example, untreated 6061 aluminum (T4) has a tensile strength of 241 MPa (35000 psi). Heat-treated 6061 aluminum (T6) has a tensile strength of 310 MPa (45000 psi). It is important for the customer to understand the strength needs of their project to ensure the right choice of alloy and temper. After heat treating, profiles can also be finished.

Surface Finishing: Enhancing Appearance and Corrosion Protection

Aluminum profiles can undergo a number of different finishing operations. The two main reasons to consider these is that they can enhance the appearance of the aluminum and can also enhance its corrosion properties. But there are other benefits as well.
For example, the process of anodization thickens the metal’s naturally-occurring oxide layer, improving its corrosion resistance and also making the metal more resistant to wear, improving surface emissivity, and providing a porous surface that can accept different colored dyes. Other finishing processes such as painting, powder coating, sandblasting, and sublimation (to c

reate a wood look), can be undergone as well. In addition, there are many fabrication options for extrusions.

Fabrication: Achieving Final Dimensions

Fabrication options allow you to achieve the final dimensions that you are looking for in your extrusions. Profiles can be punched, drilled, machined, cut, etc. to match your specifications. For example, the fins on extruded aluminum heatsinks can be cross machined to create a pin design, or screw holes can be drilled into a structural piece. Regardless of your requirements, there is a wide range of operations that can be performed on aluminum profiles to create the perfect fit for your project.

For more detailed information, you can read this article.

Plastic Cover Extrusion Process

Plastics extrusion is a high-volume manufacturing process in which raw plastic is melted and formed into a continuous profile. Extrusion produces items such as pipe/tubing, weatherstripping, fencing, deck railings, window frames, plastic films and sheeting, thermoplastic coatings, and wire insulation. This process starts by feeding plastic material (pellets, granules, flakes or powders) from a hopper into the barrel of the extruder. The material is gradually melted by the mechanical energy generated by turning screws and by heaters arranged along the barrel. The molten polymer is then forced into a die, which shapes the polymer into a shape that hardens during cooling.
For more detailed information, you can read this article.

LED Heat Sink: What Is It and Why It’s Important?

Overheating of LEDs badly affects the performance and durability of the fixture. So, to ensure a proper LED functioning and thermal management system, an appropriate heat sink installation is a must. But what is a heat sink, and why is it so important for LEDs?

A heat sink is a device that dissipates heat away from the LED light source. It prevents overheating and protects the light from damage. Thus, it also expands the life expectancy of any LED.

However, there are different types of LED heat sinks. But no worries about choosing the right one, as this article will help you! So, to get an overall idea about LED heat sinks, let’s begin the discussion-

What is an LED Heat Sink?

An LED heat sink is a device that absorbs the heat generated from the LED module and transfers it to the surrounding air. It aids in the temperature regulation of LEDs and avoids overheating. That is why an LED heat sink is vital to any LED lighting system.

The heat sink is typically made of aluminum or other heat-conductive materials. It features a series of fins and ridges that increase its surface area for better heat dispersion. This large surface area allows heat to dissipate more effectively. The LED heat sink absorbs heat from the LED and transfers it to the air. This process keeps the LED cool and functioning at its best.

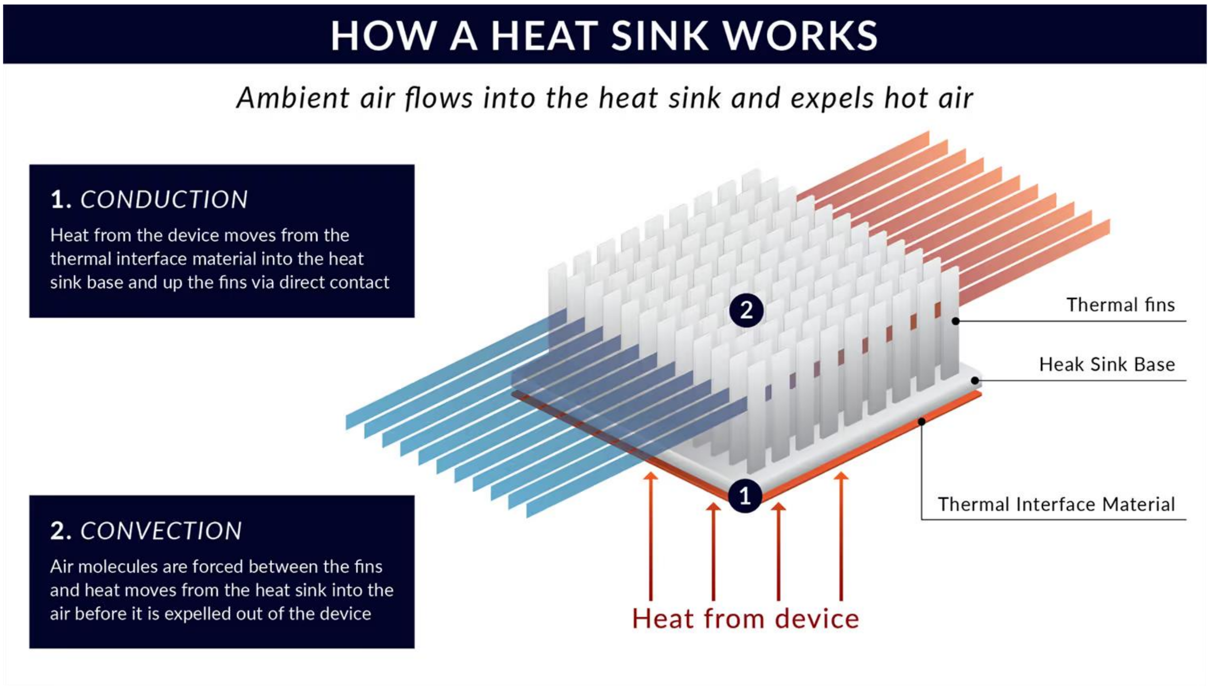
Why Is LED Heat Sink Important?

LED Heat Sink ensures the proper functioning and longevity of LED lights. And the LED lights emit light through the process of electroluminescence. Also, this generates heat as a by-product. This heat can cause damage to the internal components of the LED light. It also reduces its efficiency and lifespan. Here, the LED Heat Sink acts as a cooling device, dissipating the heat generated by the LED light. Thus, it keeps the internal components at safe temperatures.

The LED Heat Sink is designed with high thermal conductivity materials like aluminum. And such materials absorb and dissipate heat quickly and efficiently. It also has a large surface area that allows for maximum heat dissipation. Therefore, overheating can cause the LED light to overheat and become a fire hazard. So, it is critical to have an efficient heat sink in place.

How Does LED Heat Sink Work?

LED heat sink refers to the process of removing heat from an LED light source through the use of a heat sink. The process occurs in several stages:



- **Generation of heat**

When an LED light source is powered, it generates heat as a by-product of light emission.

- **Transfer of heat**

The generated heat is transferred from the LED chip to the metal core printed circuit board (MCPCB) or the heat sink.

- **Dissipation of heat**

The heat sink is a thermal bridge between the LED chip and the surrounding environment. It conducts the heat away from the LED chip and into the air. Also, the heat sink has a large surface area, providing ample space for dissipating heat.

- **Radiation of heat**

The heat sink radiates heat into the surrounding environment through a combination of convection and conduction. The heat moves from the hot surface o

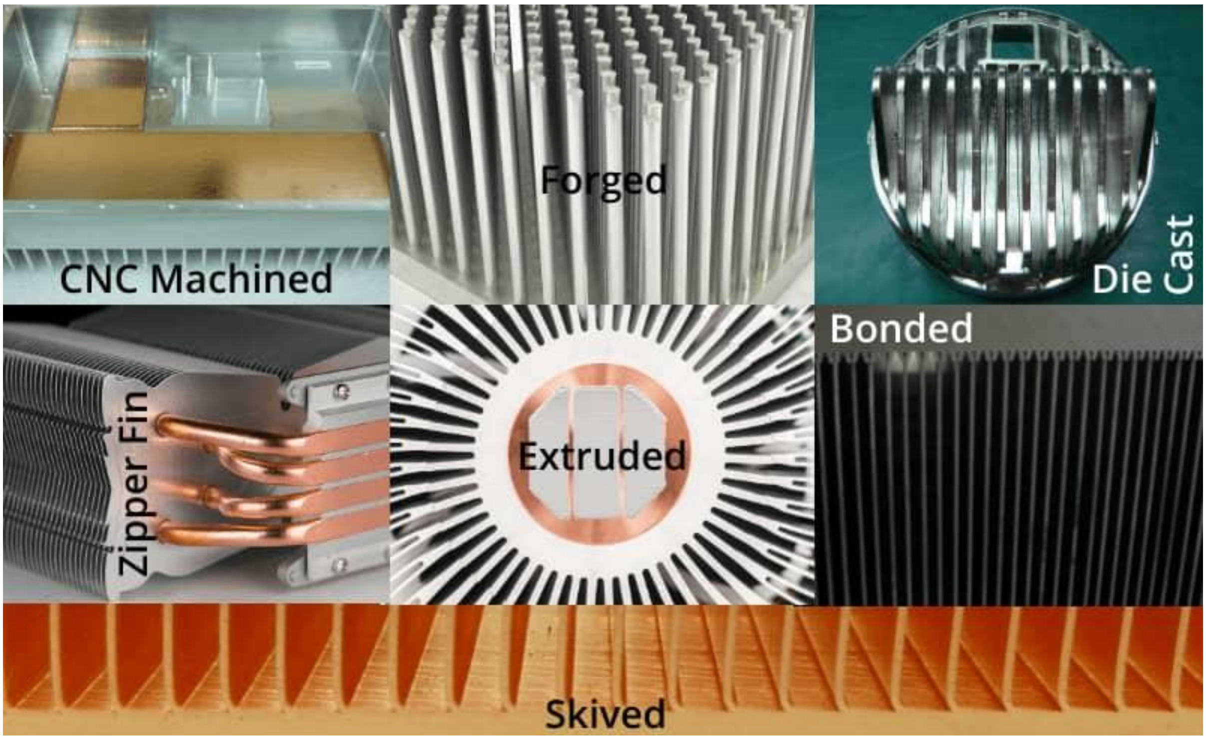
f the heat sink to the cooler air. It creates a temperature difference that drives the heat away from the LED chip.

- **Cooling of LED**

The LED chip temperature decreases as the heat radiates away, preventing ov erheating. It allows the LEDs to operate at a safe and efficient temperatur e. The heat sink also helps prevent damage to the LED chip, which can be ca used by excessive heat buildup.

Types of LED Heat Sinks

There are several types of LED heat sinks available, including active, pass ive, and combination models:



1. Active Heat Sinks

An active LED heat sink is a type of heat sink that uses a fan or other mec hanical means. They actively remove heat from a light-emitting diode (LED) device. And this helps to increase the performance and longevity of the LE D. It further prevents overheating and prolongs the life of the LED. So, fo r these reasons, active LED heat sinks are often used in high-power LED app lications.

2. Passive Heat Sinks

Passive LED heat sinks are designed to dissipate heat generated by LED lights without using any fans or other active cooling systems. They rely on thermal conduction. The passive heat sink also depends on convection and radiation to transfer heat from the LED light source. They spread the heat into the surrounding environment.

These heat sinks are typically made of aluminum. They can also be materials with high thermal conductivity. Moreover, they feature fins and other structures. It expands the surface area available for heat transfer.

In addition, passive LED heat sinks are durable and require low maintenance. They are often used in lighting applications for their low noise levels. You can also use them for their longevity and low operating costs. Besides, they are resistant to weather and environmental conditions. So, these features make them best for outdoor lighting fixtures.

3. Hybrid Heat Sinks

Hybrid LED heat sinks are thermal management devices. They combine traditional metal heat sink materials with additional elements- heat pipes, vapor chambers, or phase change materials. And the inclusion of these extra components improves the heat dissipation capability of LED lighting systems. A hybrid LED heat sink aims to efficiently remove heat generated by the LED chips, preventing thermal damage. They also improve the performance and longevity of the LED system.

4. Cold Plates

Cold plates are cooling systems designed for LED lighting fixtures. They dissipate heat generated by the LEDs and maintain optimal temperature levels. These are made of aluminum and copper. It can also be a combination of both. They work by conducting heat away from the LED. Then disperses the heat into the surrounding air. Additionally, these are lightweight, efficient, and cost-effective.

5. Pin-Fin Heat Sinks

Pin-fin LED heat sinks are made of a metal base plate with multiple pins protruding from the surface. This increases the surface area and promotes better heat dissipation. The pin-fin design is highly efficient at dissipating heat from the LED light source. It helps to maintain the temperature of the LED. Thus, it controls damage and improves performance. Also, these are popular in applications like high-intensity and long-lasting lighting. This can include street lighting, industrial lighting, and automotive lighting.

6. Plate-Fin Heat Sinks

Plate-fin LED heat sinks consist of a base plate, a series of fins, and a heat dissipation surface. The base plate is made of a highly thermally conductive material. They provide a secure mounting platform for the LED light source. The fins are placed on top of the base plate and provide a large surface area for heat dissipation. The heat dissipation surface is typically made of aluminum. It helps to draw heat away from the LED and into the surrounding air.

Plate-fin LED heat sinks are popular in lighting applications. Because they are lightweight, have a low-profile design, and are easy to install. They also have high thermal performance and are cost-effective. This type of heat sink is also ideal for high-heat applications—for example, automotive lighting and industrial lighting.

7. Extruded Heat Sinks

Extruded LED heat sinks dissipate heat from LED (light-emitting diode) lighting fixtures. They are made by extruding aluminum into a specific shape and size. It creates a finned structure that increases the surface area for heat dissipation. The heat sink is then attached to the LED fixture. This helps to keep the LED cool and increases its lifespan. Therefore, their design allows for a cost-effective and customizable solution. It is a popular choice for commercial and industrial lighting.

8. Bonded Fin Heat Sinks

Bonded fin LED heat sinks consist of a base material and fins. They are bonded together using a high-strength adhesive. This bonding process helps to improve heat transfer efficiency and reduce thermal resistance.

The fins are designed to increase the surface area of the heat sink. It allows more heat to dissipate into the air. Furthermore, this helps to keep LED lights cool. Plus, it helps to prolong their lifespan and maintain their performance. Bonded fin heat sinks are typically made from aluminum or copper. They are used in streetlights, indoor lighting fixtures, and automotive lighting systems.

9. Folded Fin Heat Sinks

Folded Fin LED heat sinks are a cooling system used in LED lighting fixtures. They are made of thin metal fins that are bent and stacked together. It creates a large surface area for heat dissipation. This design allows for a compact and efficient cooling solution. This is ideal for use in small LED lighting fixtures. The folded fin design also allows for good airflow. It helps to dissipate heat quickly and efficiently.

10. Z-Clip Retainer Heat Sinks

Z-Clip Retainer LED heat sinks are designed with a Z-shaped clip. It attaches to the LED light and holds the heat sink in place. This allows for efficient heat dissipation. They help to keep the LED light running at optimal temperatures and extend its lifespan. LED heat sinks also come with built-in LED light retaining systems. It prevents the LED light from coming loose and improves safety.

Types of Heat Sink Materials

Heat sinks come in various materials, including aluminum, copper, and polymer.

HEAT SINK MATERIALS

Heat Sink Material	Thermal Conductivity (watts per Kelvin meter)	Density (grams per cubic centimeter)
Aluminum	235 W/mK	2.7 g/cm³
Graphite Composite	370 W/mK	1.89 g/cm³
Copper	400 W/mK	8.96 g/cm³
CarbAl™ *(Applied Nanotech)*	425 W/mK	1.75 g/cm³

1. Aluminum Heat Sinks

Aluminum LED heat sinks are a popular choice for cooling LED lighting systems. They offer several key benefits, such as low cost, lightweight construction, and good thermal performance. Aluminum LED heat sinks also dissipate heat quickly. This enables the system to run at lower temperatures and improves efficiency. Additionally, aluminum is a strong and durable material. Thus it can withstand harsh environmental conditions.

2. Copper Heat Sinks

Copper LED Heat Sinks are highly efficient at dissipating heat. They reduce the risk of overheating and damage to the LEDs. Copper also has high thermal conductivity. It allows heat to be quickly transferred away from the LED. This helps maintain optimal performance over a longer period. Additionally, copper is lightweight and corrosion-resistant. This makes it a perfect alternative for industrial applications.

3. Polymer Heat Sinks

Polymer LED Heat Sinks can offer improved heat dissipation. It can also provide increased efficiency and a longer lifespan for LED products. The heat sink's unique polymer design can dissipate heat faster than traditional metal designs. This helps reduce the risk of LED failure due to thermal management issues. Polymer LEDs also require less energy to run. This makes them more cost-effective and energy-efficient.

Furthermore, LED products with polymer heat sinks have a longer lifespan than those without. This can help businesses reduce their maintenance costs. It also improves the longevity of their investments in LED lighting.

Heat Sink Materials: Aluminum vs. Copper - Which is Better?

Aluminum and copper both have their advantages and drawbacks. So it is crucial to understand their differences to make an informed decision.

Aluminum Heat Sink	Copper Heat Sink
Lightweight and low cost	Heavy and expensive compared to aluminum
High thermal conductivity	High thermal conductivity
Low mechanical strength	High mechanical strength
Not as good at conducting electricity as copper	Excellent electrical and thermal conductivity

Aluminum has lower thermal conductivity than copper, meaning it takes more time for heat to move through it. On the other hand, aluminum is significantly lighter than copper and has higher structural integrity.

Besides, copper has better thermal conductivity than aluminum. This makes it a better choice for applications that need the most effective heat dissipation. Additionally, copper does not corrode as aluminum does.

Ultimately, which material is better depends on the application's specific needs. For industrial lighting and automotive lighting, copper would be best. On the other hand, aluminum is a perfect choice for architectural lighting.

Heat Sink Design Considerations

Designing a heat sink requires consideration of several factors. These are as follows-

- **Type of Heat Sinks**

The type of heat sink has a significant impact on the overall considerations. Passive sinks are heat sinks with a large surface area or fins. They are designed to dissipate heat through convection or radiation. Active sinks are fans or liquid cooling systems. They work by actively moving air or liquid to remove heat from the source.

Hence, each type of sink has its advantages and considerations. For example, active sinks may need extra power to operate. And it can be noisier than passive sinks. Therefore, careful consideration is a must for the different types of sinks.

- **Materials Of Heat Sink**

The choice of heat sink will determine the efficiency and effectiveness of the thermal management. Since each type of material has different thermal properties.

The most commonly used types are aluminum and copper. Besides, they both have good thermal conductivity. They also have a large surface area for dissipating heat. For higher temperature tolerance, other materials may require ceramic or graphite. Additionally, you must consider the heat sink's shape and size. This ensures optimal performance and fits within any space constraints.

- **Boundary Design**

Boundary design affects the system's cooling capacity, cost, and overall efficiency. Designers can optimize the thermal performance of the system. Also, the shape and size of the heat sink affect airflow, convection, and con

duction. The Boundary design also impacts the surface area available for heat dissipation. A well-designed heat sink will have enough surface area. It will dissipate the generated heat effectively while minimizing overall costs.

MCPCBs: How It Helps the LED Heat Sink?

MCPCBs are metal-core printed circuit boards. They are designed to dissipate LED heat away from the light source effectively. The metal core of the MCPCB acts as a thermal bridge. This allows heat to dissipate from the LED to the heat sink.

MCPCB technology takes advantage of the fact that metal has a much higher thermal conductivity than FR4 (fiberglass-reinforced epoxy). Thus, it more effectively transfers heat away from LEDs. The metal core also provides structural stability. It improves electrical connectivity, making it an ideal solution for LED cooling applications.

Do LED Strips Require Heat Sink?

Small, low-powered LED strips do not typically require a heat sink as they generate very little heat. However, for high-powered LED strips, a heat sink is highly recommended. As it helps dissipate heat and prevent damage to the LED strip.

Heat sinks are often constructed of metal and serve as conductors. It pulls heat away from the LED strip and dissipates it into the surrounding air. Without a heat sink, high-powered LED strips can overheat. This will reduce their lifespan and cause them to fail. So, if you are using a high-powered LED strip, it is advisable to use a heat sink. This will ensure its longevity and optimal performance.

How To Size A Heat Sink For Strip Lights?

Sizing a heat sink to strip lights is a crucial step for the longevity and efficiency of the lighting system. Here are the steps to size the heat sink for strip lights:

Step-1: Determine the power of the strip lights

The first step is determining the power of the strip lights in watts. This information is usually available in the product specifications.

Step-2: Calculate the heat generated

The next step is calculating the heat generated by the strip lights. This can be done using the formula: Heat Generated = Power x Efficiency. The efficiency factor is usually around 90%.

Step-3: Determine the thermal resistance of the heat sink

Thermal resistance is a measure of the resistance of the heat sink to heat transfer. It is usually expressed in ° C/W.

Step-4: Determine the maximum allowable temperature rise

The maximum allowable temperature rise is the difference between the ambient and maximum temperatures the strip lights should reach. The manufacturer usually specifies this temperature.

Step-5: Calculate the required heat sink size

The final step is calculating the required heat sink size using the formula –

Required Heat Sink Size = Heat Generated ÷ (Thermal Resistance x Maximum Allowable Temperature Rise)

It is important to remember that the calculations above are simply estimations. For a precise estimate, you can speak with an expert. Additionally, consider the physical dimensions of the heat sink. These are the length and width to ensure that it fits appropriately in the lighting system.

Factors to Consider When Choosing a LED Heat Sink

The factors that should be taken into consideration when choosing a LED heat sink are as follows:

Thermal Resistance

Thermal resistance refers to the ability of the heat sink to dissipate heat away from the LED. If the thermal resistance is too high, heat will build up and cause the LED to overheat and fail prematurely.

On the other hand, if the thermal resistance is too low, the heat sink will be too bulky. This will affect the overall design of the LED system. It's essential to strike a balance between thermal resistance and other factors, such as cost, size, and material, to choose the right LED heat sink for your specific application.

Heat Flow

When selecting an LED heat sink, consider the heat flow. The heat sink's primary function is to dissipate heat away from the LED. It prevents overheating and extends its lifespan. If the heat sink cannot effectively transfer heat, the LED will eventually overheat and fail.

You should evaluate the heat flow based on the LED's power output. It also counts on the ambient temperature and the material's thermal resistance. Choosing a heat sink with high thermal conductivity and low thermal resistance is recommended. This will ensure optimal heat transfer. With proper heat flow, the LED heat sink will provide reliable and efficient cooling for the LED.

Thermal Conductivity

Thermal conductivity is the ability of a material to transfer heat from one point to another. High thermal conductivity means the heat will efficiently dissipate from the LED to the heat sink. Using a heat sink of better thermal conductivity prevents LEDs from overheating. However, different materials have different thermal conductivity capacities. For example, aluminum's thermal conductivity ranges from approximately 170-251 W/mK. At the same time, copper's thermal conductivity is higher than aluminum's, with a value of roughly 401 W/mK.

Perfect Heat Sinks Type

Passive heat sinks are designed to dissipate heat through natural convection and conduction. Hence, they do not rely on active cooling methods such as fans or water cooling. This can be an attractive option for some applications as it eliminates the need for maintenance and noise. It also stops potential failure points associated with active cooling. Additionally, passive heat sinks can be more cost-effective. It also has a smaller form factor than dynamic cooling solutions.

Natural Convection

Natural convection refers to the flow of heat transfer through a fluid, usually air. In this process, the fluid/air flowing across the warm heat sink removes heat from the surface and transfers it into the surrounding environment.

However, increasing the air turbulence between the fin spacing of the heat sinks greatly enhances natural convection. In this case, the design and structure of fins/plates matters. For example- fins with drilled holes accelerate the cooling mechanism. So, consider this factor before choosing an ideal heat sink for your LED.

High Heat Dissipation

High heat dissipation allows the LED lights to operate at a lower temperature. It reduces the risk of damage from overheating and increases the lifespan of the lights. And this type of heat sink reduces the energy required to cool the lights. It, in turn, reduces overall energy consumption. Also, a high heat dissipation heat sink helps to reduce maintenance expenses in the long run.

Shape and Size of Fins

The size and number of fins will determine the surface area for heat to dissipate. At the same time, the fins' shape can affect the heat sink's airflow and overall efficiency. Besides, a heated sink with large, evenly-spaced fins will provide better heat dissipation. Compared to one with small, cl

osely spaced fins. Additionally, the shape of the fins, such as flat or curved, can also influence the heat dissipation performance.

How To Install a LED Heat Sink?

Here is a step-by-step guide to installing a LED heat sink:

Firstly, prepare the LED for heatsink installation. If the LED is new, insert it into the LED holder or socket. If the LED is installed, ensure it’s securely in place and won’t come loose during the heat sink installation process.

Secondly, clean the LEDs and heat sink’s surface with isopropyl alcohol to ensure a strong bond. Apply a small amount of thermal compound to the surface of the LED. This inclusion will improve the heat transfer between the LED and the heat sink.

Thirdly, align the heat sink with the LED and attach it to the LED holder or socket. Depending on the heat sink and LED holder’s design, this may involve screws, clips, or a combination of both. Once the heat sink is securely attached, turn on the LED and check for proper operation. The LED should be bright and stable without any flickering or dimming.

Finally, if the LED works properly, tighten any screws or clips to ensure a secure connection. If necessary, add a thermal compound to improve heat dissipation.

How to Maximize the Efficiency of Heat Sink?

It’s vital to ensure that it is correctly sized to maximize the efficiency of an LED heat sink. Also, adequately constructed and suitably installed. Verify that the heat sink is large enough to withstand the heat generated by the LED device. If it is too small, it won’t dissipate heat effectively. Additionally, selecting a high-quality material with good thermal conductivity is a must. This will help to ensure optimal performance.

Finally, proper installation is essential for optimal performance. Ensure the LED heat sink is securely attached to the device. Also, ensure that there are no gaps in the assembly that could interfere with airflow. These steps will help ensure that your LED heat sink operates efficiently.

Does the Weight of the Heat Sink Matter?

Yes, the weight of the heat sink does matter. The heavier the heat sink is, the better it will dissipate heat and keep the components cooler. Heavier heat sinks also have more surface area. This allows them to absorb more heat from the components they are cooling. So when choosing a heat sink, it's essential to consider its size and weight.

LED Controller: A Comprehensive Guide

LED stripes with a smart LED controller can take your interior and exterior lighting to the next level. It is excellent for playing with light colorings. In addition, they give you a wide range of experimenting options with the entire outlook of your room.

LED Controllers are devices that support the light-controlling facilities of an LED stripe. Different types of LED stripes require specific variants of LED controllers to dim or change the light settings. So, all controllers are not suited for every LED strip. Therefore, before purchasing a LED controller, it is essential to know its types, uses and connection procedures, etc.

However, this article will give you a detailed idea about LED controllers, their categories, ways to face troubleshooting, and more. So, let's get started-

What Is an LED Controller?

As soon as you get an LED strip light, you can't wait to go home and customize it to your taste. And for that, an LED controller is a must-buy if you want to create different lighting effects with your LED strips.

You might now be wondering what an LED controller is. It is a unique chip-processing light controller that acts as a switch to the LED strips. And this device lets you control the lights' intensity, color, and lighting patterns.

The best feature of an LED controller is that it enables wireless or Bluetooth control of the lighting. Plus, it allows you to dim the light, switch it on or off, and change or adapt the light color. Therefore, the LED controller is essential for operating and experimenting with multi-color LED strips.

What Does an LED Controller Do?

LED controllers mix colors and provide variants of hues on LED strips. Thus, they allow you to control the light colorings. For example, a LED controller can make purple lighting by mixing the red and blue colors of RGB strips in appropriate proportion to make purple. Again, you can get yellow lighting as the LED controller combines red and green. Similarly, it is possible to get many other lighting colors using an RGB LED strip with a LED controller.

Besides, in dim-to-warm and tunable white LED strips, a compatible LED controller adjusts the color temperature of the lighting and provides different tones of white.

Also, LED controllers offer different lighting patterns like- flash, blend, smooth, and other lighting modes. However, what is more impressive about the LED controller is that it has DIY color-making options that take your lighting to the next level.

Benefits Of Using an LED Controller

Changing the colors of your LED strips using a LED controller is an excellent idea, especially if you're planning a party or want to draw attention to your sparsely decorated home. The following characteristics are included in every LED controller:

Adjustable Brightness Level

This functions to change the lighting brightness, and it makes the light glow brighter. So, you can control the night mode, which you may wish to shift to your room occasionally.

Lights’ Color Selection

Different pre-setted color options are available with a LED controller. You will find various variants of red, blue, and green colors within the remote. Besides these fixed colors, there are also DIY color mixing options.

Easy Color-Changing Modes

The LED controller allows you to switch colors easily. Just by pressing the buttons on the remote control, you can change the complete ambiance of your room. Also, there are different options for lighting patterns in the remote, such as flash, smooth, fade, etc.

Customizable Color

The LED controller includes a multicolor controller to mix red, green, blue, and sometimes white colors into your chosen customized color. You also have a choice known as “DIY,” where you can mix and match the colors you like and build it up however you see fit. So whether you want to make a statement with a bright, bold color or create a subtle and calming atmosphere, you can customize your lighting to suit your mood and environment.

Types & Features Of LED Controller

There are different types of LED controllers. Each of these has its specific functions and limitations. So, before purchasing one for your LED strips, look at the below categories of LED controllers:

IR LED Controller

IR stands for “Infrared Radiation.” This controller is frequently used at home because it is inexpensive and simple to use compared to other types.

Pros	Cons
Not subject to electromagnetic interferenceLow-costing	Short control distanceDevices that don’t meet the same requirements are incapable of receiving signals from them.

RF LED Controller

It’ s referred to as radiofrequency. It connects both devices through a signal of some kind. This kind of controller is thought to have a medium range.

Pros	Cons
Best for long-distance commutingSignals can penetrate objects and wallsNo face-to-face approach to light is required	Bit pricey

Wi-Fi LED Controller

You can assume from the name that it requires Wi-Fi signals to connect to the sender. With a phone, remote control, or any other wireless device, you can connect to it. The Wi-Fi LED controller has the most extensive range of features compared to other controllers.

Pros	Cons
Covers a vast areaNo cables or wires are necessaryCompatible with smartphone APPAllows voice control	Low networking capacityLimited expansion, primarily used in home

Bluetooth LED Controller

This type of controller utilizes Bluetooth signals to connect the sender and controller.

Additionally, as it doesn’ t require a network to connect or function, it is the best backup choice when there is no network.

Pros	Cons
Easy installationGood user experiencelow power consumptionCompatible with smartphone APP Allow voice ControlLow cost	Incompatible protocols between different devicesLimited control distance

0/1-10V LED Controller

Full touch control is available on the RGBW 0-10V LED controller. It provides each RGBW with quick color adjustment, brightness control, and many styles and effects.

Pros	Cons
Reduces electricity useNo additional switch is requiredSuitable for multi-purpose lighting	Not compatible with the driver

DMX LED Controller

A digital control system used in the lighting world is called a DMX controller or Digital Multiplex. Most manufacturers use it to light tables and projectors. It acts as a communication conduit between the gadget and its controller.

Pros	Cons
Operates at low voltageAllows light customization Independent control between light sectionsVersatile lighting options Suitable for controlling larger light installation Can sync with music	Requires more cablesIncreased setup time with increased wiringExpensive

DALI RGB Controller

Digital addressable lighting interface is abbreviated as "DALI RGB controller." It is a two-way communication controller used in professional settings when numerous lighting fixtures are connected by just one light source.

Pros	Cons
Enables quick and accurate controlEasy installation Reduce maintenance costDay-light sensing option	Expensive

What Is the Most Effective LED Controller?

A remote-like tool called an LED controller is used to operate any LED light. The transmission method can be divided into various categories, including Bluetooth LED controller, IR LED controller, WiFi LED controller, RF LED controller, ZigBee LED controller, DALI LED controller, and DMX LED controller.

In the context of intelligent technology, there are three different types of LED controllers: WiFi, Bluetooth, and Zigbee.

Yet, when it comes to choosing the most effective one, it would be a tie between WiFi and Bluetooth LED. This is because Bluetooth LED controllers are more energy-efficient and cheaper than any other LED controller. Besides, they are suitable for small-area lighting control. So, if you are looking for a LED controller for your bedroom or any small space, going for Bluetooth ones will be an ideal choice.

On the other hand, WiFi LED controllers are renowned for their fast transmission rates. Besides, they allow you to operate the LED strips longer distances than the Bluetooth system. That is why I choose WiFi over Bluetooth LED controllers. Yet, if pricing is a concern, you can also go for Bluetooth one's.

How To Connect an LED Controller To an LED Strip?

An LED strip controller is essential to a commercial color-changing LED lighting system. The user can adjust the brightness, switch the color, change the temperature, set a timer, set up multiple modes, turn on and off the switch, and personalize the color depending on the strip type and controller.

Different LED strip controllers exist, including RGB, RGB+W, RGB+CCT, and single color. You can directly link the power supply and LED strip to the controller. Also, you will use remote or other devices to connect with the controller to operate the strip.

- First, pick the LED strips you want. Next, select a power source and an LED controller. You need a DC power source with a specific voltage to connect to the controller.

- While attaching the LED strip to the controller, you'll notice lettering on the LED strip that indicates how to wire it up correctly.

- Considering that you must connect R-RED, G-GREEN, and B-BLUE to the same controller terminal.

- Be aware that the controller's V positive will be connected to the strip's V positive.

- To install the wires, you must unscrew each terminal on the controller's backside.

- Make sure to connect the wires correctly, then screw the terminal down such that it rests on the bare wire rather than the insulation surrounding it.
- The power supply will then be connected to the controller and power the strip afterward.

- To pair the controller with the LED strip, hit the button once within three seconds of the LED strip turning on.

- Following that, you can operate the strip using the remote.

That is how an LED strip and an LED controller are quickly connected at home. It is possible to do it fast by using the internet or viewing YouTube videos.

How To Pair LED Remote To LED Controller

You can pair an LED remote with an LED controller using the techniques listed below. But be aware that it can vary depending on the manufacturer and how many lights you want to pair.

Depending on the brand you bought, you must first push any button to access the LED controller settings. Then, as soon as it turns on, press any number key until all the lights flash red to confirm that the controller and remote are both in the same position. You will restore the LED controller's color once it has been connected.

Thus, you can easily connect an LED remote to an LED controller.

Are all LED Controllers the Same?

No, not all LED controllers are equal. Specific remote controllers may be compatible. It depends on the brand of the LED strip. Some brands could have dedicated remotes for their strips. Others might support more than one type of remote.

Furthermore, specific LED strips may be chainable. Hence, they can join them without requiring a second controller. If your LED light is a well-known brand, a remote made by that company ought to function. Controlling several strip lights with a single remote is also possible.

Some LED controllers are developed exclusively for RGB light strips and pre-programmed lighting settings. Other controllers can dim or control several lights simultaneously.

Additionally, you can use RF controllers ranging up to 20 meters to control RGB LED light strips. Furthermore, analog and digital controllers and repeaters with the same power supply as the controller are available.

Installation of LED Controller

Installing an LED controller is a straightforward process. You can complete it in a few stages.

- Selecting the location for the controller installation is the first step. It is usually better to install it near a power source, such as an outlet or switch.

- You should also ensure that the controller is easily accessible to modify the settings. And, of course, without moving furniture or climbing ladders.

- Once you've chosen a position, you'll need to run the appropriate wire from the power supply to the controller. Depending on your arrangement, you are routing cables through walls, ceilings, and beneath rugs.

- Checking your local construction codes is essential before running cables through walls.

- If you need to know how to attach the cables correctly, seek the advice of an expert.

- Once the wire is in place, connect the controller to a power source and test it.

- Check that all connections are secure and everything is in working order.

With these simple steps, you should have your LED controller up and running quickly!

How To Customize Colors With an LED Controller?

LED controllers customize the colors of the lighting system. It is an excellent way to bring vitality and originality to your environment. If you have the right tool, it can be simpler than you think!

Here’s how to adjust the colors on an LED controller:

- Choose the type of controller you require. Several LED controllers are available. It depends on your lighting system and the functions you want. Conduct the study and select one that meets your requirements.

- Connect the lighting system to the controller. Attach the appropriate type of LED controller to your lighting system using the instructions in the user manual.

- Configure the options. The settings on the LED controller may vary based on the device. However, most controllers will allow for basic customization. Such as changing color themes and brightness levels.

- For each channel, select the appropriate color and intensity. You can do this by utilizing a color wheel, or pre-programmed color presets.

- Examine the settings and make any required adjustments. Once you’ve customized the parameters, test them out. Also, make any modifications necessary to achieve the desired effect.

These procedures can create seamless customization of the colors of your lighting system.

Things To Consider While Installing LED Controllers

Before putting LED controllers in your house or company, consider these specialties:

Well Ventilation

When deciding where to put the LED controller, ensure it has enough airflow. The space should be well-ventilated. Also, you should provide lots of fresh air to remove any heat the controller creates.

Also, consider supplying extra cooling with fans or other equipment. Keeping combustible objects away from the controller is also critical. Hence, they might catch fire if subjected to extreme heat. Finally, before installation, examine your manufacturer’s instructions. If you have any queries about ventilation needs, follow them.

Match The Power Supply

When installing LED controllers, ensure the power is correct. And they are functioning correctly. The power source should match the LED controller’s voltage and amperage.

It’s also essential to ensure the wattage rating is enough for the number of controlled LEDs. When in doubt, get guidance from an expert on selecting the best power supply for your application.

Prohibit Wiring With Electricity

Ensure all electrical connections are properly secured and insulated when wiring LED controllers. This helps to avoid electric shocks or fires caused

by poor wiring. It is also critical to double-check the wiring before attaching the controller to the power supply.

It is advisable only to use the controller if any connections are secure or have exposed wires. Instead, contact a professional for help.

Troubleshooting the LED Controller

While operating an LED controller, you may face several problems. Some such conditions are as follows-

LED Light Flickering

If the power source fails, the LEDs may flicker or stop working. You should inspect the circuit board’s connections if this does not work. Check that they are tight and secure. Make sure that all components are securely placed onto the board. The most straightforward solution for light flickering is to replace the controller’s power source.

Yet, if the flickering persists, it might be due to a defective component on the board or poor cabling. In this case, expert help is needed to replace or adequately rewire the component.

Bad Pin Connection

First, inspect your LED controller’s pins. Also, check the connections to verify that they are not deformed or broken. If they are, straighten them out using a little pair of pliers.

Second, ensure that the pins are securely linked and in position. If they are loose, you can use a tiny quantity of solder to fix them in place.

Finally, inspect your wires for signs of wear and strain. Replace any frayed or broken cables with new ones to maintain a secure connection.

Poor Connection Between Cutpoints

Begin by checking the connections between the cutpoints. Check that all cables are secure and free of corrosion or other problems. If the connection a

ppears to be secure, investigate the power source. Check that it gives you the correct voltage and enough power to power your LED controller.

If the connection between the cutpoints is still not operating correctly, it may be time to replace some of the LED controller's components. Examine the parts for flaws and replace them if necessary.

It is also critical to ensure that all your components are interoperable to operate at the proper voltage.

Low Voltage from Mains Power Supply

A controlled power supply is one approach. A regulated power supply keeps the voltage output stable. It also allows the LED controller to receive the proper amount of electricity.

Another possibility is connecting a capacitor between the power source and the LED controller. This will help stabilize the voltage output from the primary power source. In addition, it can reduce the ripple effect that might cause low voltage.

Communication Error from the Controller

The first step is to ensure that the controller and the LED lights are correctly connected. Then check for loose or damaged wires and ensure all cables are locked. Finally, restart the controller if all connections are in good working condition. This can assist in resolving any communication challenges that may have arisen.

You might reset the controller to factory defaults if none of these alternatives work. It is possible to do so by momentarily pressing and holding the reset button. This should handle any communication difficulties after finishing this.

Radio Interference from External Sources

One of the most common ways to reduce interference frequency is to use shielded cables. Shielded cables are designed to block out unwanted signals. In addition, they make them effective at lowering interference from outside sources.

Yet, it is also vital to ensure that all wires are securely tied and fixed appropriately for most safety.

The EMI filter is another option. This gadget assists in filtering out undesired radio frequencies, thus reducing interference. It can mount between the LED controller and the external source. Or directly on the LED controller.

Malfunctioning Power Supply

First, look for any loose or disconnected wires in the power supply. If the cables are not correctly connected, electricity will not flow properly, leading to the power supply failing.

Hence, the fuse could have blown if you had not connected all the wires correctly. Therefore, you can resolve the problem by replacing the defective fuse.

Voltage Conversion

Voltage regulators are the initial answer to this problem. Regulators regulate the incoming voltage to the required level. This system has the advantages of being straightforward to install and dependable.

A DC-DC converter is the second option. This gadget will transform the input voltage into a new form. This can be handy if you operate an LED controller at a lower voltage.

Auto-transformers are the third option. This gadget will transform the input voltage into a new form, allowing you to use the LED controller at various voltages.

Excessive Brightness

Adjust the dimmer settings: Many LED controllers include built-in dimmers that you can use to lessen the brightness of the lights. Change the darker settings to get the desired effect.

Add a dimming circuit: If the LED controller lacks a built-in dimmer, you can buy a dimming circuit. After that, insert it into the controller. This allows you to customize the brightness of your lights as required.

A Complete Guide to LED Drivers

As energy laws have gotten stricter, most people know that LEDs, or light-emitting diodes, last a long time and save energy. But few people understand that these high-tech light sources can't work without an LED driver. LED drivers, sometimes called LED power supplies, are like ballasts for fluorescent lights or transformers for low-voltage bulbs. They give LEDs the electricity they need to run and work at their best.

What Is An LED Driver?

An LED driver controls how much power an LED or a group of LEDs needs. Since light-emitting diodes are low-energy lighting devices with long life and low energy use, they need specialized power sources.

The main jobs of LED drivers are to provide low voltage and protect LEDs.

Each LED can use up to 30mA of current and work at voltages of about 1.5V to 3.5V. Multiple LEDs can be used in series and parallel to make home lighting, which may need a total voltage of 12 to 24 V DC. The LED driver turns the AC around to meet the needs and lowers the voltage. This means that the high AC mains voltage, which ranges from 120V to 230V, must be changed into the low DC voltage that is needed.

The LED drivers also protect the LEDs from changes in voltage and current. Even if the mains supply changes, the circuits ensure that the voltage and current going to the LEDs stay in the suitable range for them to work. The protection stops the LEDs from getting too much voltage and current, which would hurt them, or insufficient current, making them less bright.

How Do LED Drivers Work?

When the temperature of an LED changes, so do its forward voltage needs. As it gets hotter, less voltage is needed to move current through the LED, so it uses more power. Thermal runaway is when the temperature goes up out of control and burns out an LED. The power output levels on LED drivers are ma

de to meet the needs of LEDs. The driver’ s constant current keeps the temperature stable by responding to changes in the forward voltage.

What Is An LED Driver Used For?

Transformers for low-voltage light bulbs do the same thing that LED drivers do for LEDs. LED lights are low-voltage devices that usually run on 4V, 12V, or 24V. To work, they need a source of direct current power. But because wall socket power supplies typically have a much higher Voltage (between 120V and 277V) and produce alternating current, they are not directly compatible. Since the average voltage of an LED is too low for a regular transformer, special LED drivers are used to convert high-voltage alternating current to low-voltage direct current.

The other thing that LED drivers do is protect against power surges, and changes, which can make temperatures rise and light output go down. LEDs are made to only work within a specific range of amps.

Some LED drivers can also change the brightness of the connected LED systems and the order in which the colors are shown. To do this, you must carefully turn each LED on and off. For example, white lights are usually made by turning on a bunch of different-colored LEDs at the same time. If you turn off some of the LEDs, the white color disappears.

Various Dimensions To Describe LED Drivers.

- **External vs. Internal LED Driver**

Differences between external and internal LED drivers can be built into lamps (interior), put on the surfaces of light fixtures, or even put outside of them (External). Most low-power indoor lights, especially bulbs, have LED drivers built in. This makes the lights cheaper and more attractive. On the other hand, downlights and panel lights usually have LED drivers on the outside.

When using a lot of power, like street lights, floodlights, stadium lights, and grow lights, external LED drivers are used more and more. This is because the heat inside the lights gets worse as the power goes up. Another good

thing about external LED drivers is they can be easily changed for maintenance.

- **Switching Power Supply vs. Linear Regulator**

Because linear LED drivers are so simple, a resistor, a controlled MOSFET, or an IC may be all needed to make an LED’s constant current. A lot of AC LED, sign, and strip applications use them. Because of this, power supplies can change very easily, and there are now a considerable number of constant voltage power sources, such as 12V and 24V LED drivers. A linear regulator wastes a lot of power, so the light can’t be as bright as it could be with a switching power supply.

High-efficiency switching supplies naturally lead to high light efficacy, which is the most important thing for most light applications. Also, switching power supplies flicker less, have a higher power factor, and can handle surges better than AC LEDs.

- **Isolated LED Drivers vs. Non-Isolated LED Drivers**

When we compare these two things, we call each of them a switching power supply. According to UL and CE regulations, the isolated design usually works at 4Vin+2000V and 3750Vac, and the input and output voltages are well separated. Using a highly insulated transformer instead of an inductor as the part that transfers human power makes the system safer. Still, it also makes it less efficient (by 5%) and more expensive (by 50%). Insulation keeps the high voltage from going from the input to the output. On the other hand, low-power built-in designs usually use non-isolated designs.

- **Constant Voltage vs. Constant Current LED Driver**

Because LEDs have unique V-I characteristics, it goes without saying that a constant current source should power them. However, a constant voltage LED driver can be used if a linear regulator or resistor is connected in series with the LED to limit the current. Signs and strip lighting usually use constant voltage LED drivers with 12V, 24V, or even 48V because they are much more efficient than constant current LED drivers, which are the norm for general lighting like bulbs, linear lights, downlights, street lights, etc. As long as the total wattage doesn’t exceed the power supply’s limit, the

constant voltage solution makes it easy for users to change the amount of light, giving it much flexibility for installation in the field.

- **Class I vs. Class II LED Driver**

In this case, I and II are written in Roman numerals instead of 1 and 2, which means something completely different, as you can see in the next item. IEC (International Electro-technical Commission) regulations use the terms Class I and Class II to describe how a power supply is built on the inside and how it is electrically insulated to keep users from getting an electric shock. IEC To keep people from getting shocked by electricity, Class I LED drivers must have protected earth connections and essential insulation. There is no need for a protected earth (ground) connection because IEC Class II input models have extra safety features like double or strengthened insulation. Class I LED drivers often have a ground connection at the input, while class II drivers don’t. However, class II drivers have higher insulation levels from the input to the enclosure or the output. And here are the most common symbols for classes I and II.

- **Class 1 vs. Class 2 LED Driver**

The Arabic numbers 1 and 2 stand for the NEC (National Electric Code) ideas of class 1 and 2, respectively. These ideas describe the output of a power supply with less than 60Vdc in a dry location and 30Vdc in a wet spot, less than 5A current, and less than 100W power, as well as the detailed requirements for the circuit design feature. Using class 2 LED drivers has a lot of benefits. Their output is considered to be a safe terminal, so no extra protection is needed at the LED modules or light fixtures. This saves money on insulation and safety tests. UL1310 and UL8750 set the rules for Class 2 LED drivers. But because of these limits, a Class 2 LED driver can only power a certain number of LEDs.

- **Dimmable vs. Non-Dimmable LED Driver**

In this new time, every light is made to be dim. This is a big subject because there are many ways to dim lights. Let’s talk about each one in turn.

1) 0-10V/1-10V dimming LED Driver

2) PWM dimming LED Driver

3) Triac dimming LED Driver

4) DALI dimming LED Driver

5) DMX dimming LED Driver

6) Other Protocols of LED Driver

- **Waterproof vs. Non-Waterproof LED Driver**

IEC 60529 uses the IP (ingress protection) certification as the only way to classify the degree to which LED drivers are waterproof. The IP code is made up of two numbers. The first number rates the protection against solid objects on a scale from 0 (no protection) to 6 (no entry of dust), and the second number rates the protection against liquids on a scale from 0 (no protection) to 7. (8 and 9) don’ t come up very often in the lighting business. LED drivers with IP20 ratings or lower are used inside, while waterproof drivers are used outside. But this doesn’ t always happen. For example, some indoor applications use waterproof LED drivers because they can put out much more power than low IP ones without needing an active cooling system, making them last less than IP-rated LED drivers.



What Is A Ballast And Why Are They Not Used In LED Lights?

When light bulbs were made for the first time, they had a mechanism inside them. The job of this thing was to slow down the flow of electricity through a circuit. Ballast is the name of this thing. If this wasn’t used in light bulbs and T8 light bulbs, there was still a chance that too much electricity could build up (tube lights). Ballast is still used in bulbs and tube lights to keep the current from getting too high. Ballasts are also often used with HID, metal halide, and mercury vapor lights.

- **Magnetic Ballast**

Inductors, also called magnetic ballasts, give some lamps the right electrical conditions to start and run. Act as a transformer, giving out clean and accurate electricity. Even though it was made in the 1960s, it was used from the 1970s to the 1990s. You can find them in High-Intensity Discharge (HID) lamps, Metal Halide lamps, mercury vapor lamps, fluorescent lamps, neon lamps, and so on. Before LEDs started to replace this technology around 2010, it was used in almost all important parking lots and street lights for about 30 years.

- **Electric Ballast**

In an electric ballast, a circuit is used to limit the load or amount of current. Electronic ballast tries to keep the flow of electricity more steady and accurate than magnetic ones. People started using these more in the 1990s, and they are still used today.

- **Function Of A Ballast**

A ballast controls how much electricity goes to the bulbs and gives them enough power to turn on. Since lamps don’t have control, they can use too much or too little electricity on their own. The ballast ensures that the amount of electricity going into the lamp doesn’t exceed what the light’s specifications allow. Without a ballast, a light or bulb will quickly draw more and more electricity, which could get out of hand.

When a ballast is put into a lamp, the power is stable, and the ballast controls the energy so that the current doesn’t go up even when the lights are connected to high-power sources.

- **Why Don’t LEDs Use A Ballast?**

LEDs don’t need a ballast for several reasons. First of all, LED lights don’t use much electricity. Also, you need an AC-to-DC converter since LEDs usually run on Direct Current (DC). The socket must be wired directly when switching to LED corn light bulbs. Lastly, because LEDs are much smaller than bulbs and tube lights, there is no extra space for ballast to fit. LED drivers can be made to take up much less space. Some experts also think that because LEDs don’t need a ballast, they use less energy and give off more light.

- **Ballasts vs. LED Driver**

LED and fluorescent lights can’t work without a converter between the bulb and the power source. On one hand, standard incandescent lamps heat a filament with electricity to make light. LEDs, on the other hand, use led drivers instead of ballasts. Ballasts and lead drivers do many of the same things, so getting them mixed up is easy.

This is made possible by fluorescent ballasts, which send out a high-voltage spike at the start of the lamp’s life. Once the light is turned on, this spike acts as a current regulator. The led power driver changes the power source into a specific voltage and current, which then makes the LED light up. Both of them keep the light from being affected by the power source.

An LED driver is needed to change the alternating current into the direct current that LEDs need. LEDs can’t be powered directly by alternating current, so an LED driver is required to change it. Ballasts have changed a lot in how they are made and how complicated they are. Ballasts can run fluorescent lights but not LEDs or lights that use less energy. Several LED drivers seemed to have taken out the ballasts. Because it works better, the LED driver can do most of the things that the ballast does.

How To Use An LED Driver?

Instructions for setting up LED drivers

1. Make sure your LED driver works with both the LED systems you want to connect it to and the power source you want to use. Both the Amperage and Voltage ratings must be the same.

2. Make sure the driver won’t have to deal with problems in the environment that it wasn’t made to handle. For example, if you want to put LEDs outside, ensure the driver can handle water well enough.

3. Once you know which wires are positive and negative, you can unplug your socket from the grid.

4. Use screws of the correct color to attach the driver to the LED system.

5. Connect the positive and negative wires from the LED system to the right terminals on the driver.

6. Connect a grounding terminal to the green grounding wire coming from the driver (the GND).

7. Connect the positive and negative wires from the power socket to the positive and negative terminals on the driver.

8. Check the installation carefully to ensure that all the connections are tight and in the right place and that heat is not building up. If something goes wrong, turn off the power and figure out what’s wrong.

How To Repair An LED Light Driver?

1. Turn the power off.

2. Open the driver with a screwdriver and look carefully for burn scars and other flaws that are easy to see.

3. Use electrical testing equipment to find the parts that are broken.

4. If you can, switch out these parts and test the device again. If it can't be done, the whole driver has to be changed.

Factors To Consider Before Choosing An LED Driver

- **DC Dimming**

Would you like LEDs to be less bright? Or do you plan to change how bright it is? Then choose a dimmable driver or power supply. Why? The power sources are easy to tell apart because of how they work. The specifications table also has extra information, like what kinds of dimmer controls can be used with the drivers.

- **Power Requirements**

One of the first things to consider is how much voltage your lamp needs. So, if your LED needs 20 volts to work, you should buy a 20-volt driver.

In short, the goal is to ensure that your driver gets the right amount of power. The general rule is that you should do your job within the range of the light.

For a constant-voltage driver, you can also think about the voltage range. But you can measure both voltage and current ranges with a constant-current driver.

Pay attention to how much voltage the proposed LED light will use. So, ensure the LED driver can handle the voltage from the LED. In this way, it is easy to step down to the needed output voltage.

Also, you should think about watts. During this process, make sure to buy a driver with a higher maximum wattage than the light.

- **Power Factor**

The power factor helps determine how much power the driver uses from the electrical network. And the range is usually from -1 to 1. Since this is the case, a power factor of 0.9 or more is the norm. In other words, as the number gets closer to one, the driver works better.

- **Safety**

Your LED drivers should meet several different standards. For example, we have UL classes 1 and 2. Use the UL Class 1 for drivers that put out a lot of voltage. The fixture needs to be set up safely for drivers in this group. It can also hold more LEDs, which makes it work more efficiently.

At the level of LEDs, the UL Class 2 drivers don’t need a lot of safety features. It also meets the standards set by UL1310. Even though this class is safer, it can only run a certain number of LEDs at a time.

The IP rating is another way to measure how safe a driver’s cage is and what it can do. If you see IP67, for example, it means that the driver is safe from dust and brief immersion in water.

- **Efficiency**

This part is crucial because it shows how much power the LED driver needs. The value is shown in terms of percentages. So, you could expect it to work between 80% and 85% of the time.

Benefits Of An LED Driver

Low voltages of 12 to 24 volts power LEDs with direct current. So, even if your AC voltage is high, between 120 and 277 volts, an LED driver will change the direction of the current. In other words, stepping down from alternating to direct current is helpful. You can even find the right amount of high and low voltage.

LED drivers keep LEDs safe from changes in voltage or current. If the voltage of an LED changes, the current supply may change. Because of this, LED lights’ output is inversely related to how many they have. LEDs are also only supposed to work within a specific range. So, too little or too much current will change how much light comes out or cause the LED to break quickly because it gets too hot.

Overall, LED drivers have two main benefits:

1. Changing from AC to DC.
2. The drivers help ensure that a circuit’s current or the voltage doesn’t drop below its rated level.

Does New Illuminant Equal New Dimming?

Other light sources can be turned off quickly by changing the voltage, but LEDs can only be turned off by changing the ratio of voltage to current. Because of this, there are different ways to dim LEDs:

- With pulse width modulation (PWM) or pulse duration modulation (PDM), the amount of time that voltage is given can be changed (PDM). However, the voltage itself does not change. In other words, PWM quickly turns the LEDs on and off. This happens a lot when the frequency is above 100 Hz. The brain thinks the room is darker because the human eye can't tell flickering is happening until at least 75 Hz.

- Triacs and phase control dimmers were first made for 60W incandescent bulbs, which give off a low amount of light when the phase angle is 130°. On the other hand, LEDs are much better and use much less electricity to light up. Because of this, LEDs are not very dim at a phase angle of 130°. Also, the holding current may not be enough to keep the triac in the conductive state when the dimming is high. Because of this, LEDs start to flicker. Still, some LED drivers are built on the inside to get around this problem.

- 1-10V: In the 1-10V method, ballasts and control units are connected by a polarized two-wire control line. DC voltages between 1 and 10 volts are used to control the light, and as the voltage increases, so does the light's brightness. You can dim LED elements with 1-10V, but they need power sources. The control unit must also be able to take in the current that the power supply sends through the control line. So, 1-10V dimming is a better choice for large lighting systems.

When Does An LED Driver Become Necessary?

Most of the time, every LED light source needs a driver. But the main question should be, "Do I have to buy one separately?" The problem is that some LED light bulbs have a driver built right in. Also, LEDs made for home use often come with LED drivers. And a great example is 120-volt bulbs with bases that are either GU24/GU10 or E26/E27.

Low-voltage LEDs, such as tape lights, MR bulbs, outdoor-rated lights, panels, and other lighting fixtures, need an LED driver to work correctly.

When working with low-voltage LEDs, you need LED drivers. But you can’t say the same about 120-volt LED bulbs used in homes.

Print Mounting And HighBay Mounting

LEDs can be put in HighBay mounting and print mounting in several ways, depending on the project’s needs: For example, so-called SMD (surface-mounted device) LEDs can be used in tighter spaces. Because they can be soldered onto printed circuit boards, they don’t need wires. Still, check to make sure that all of the parts fit together.

In bigger rooms, there needs to be more light. Because of this, factory halls and department stores use HighBay spotlights, which are powerful ceiling lights. These have to be wired separately, but they are very strong. They can be wired to the standard mains voltage of 230V AC. To keep the LEDs from getting too hot, drivers like the XBG-160-A are connected in front of them. These have protection against overload that can actively limit how much current is sent.

LED Driver Types

- **Constant-Current**

This LED driver only needs a fixed amount of output current and a range of output voltages. Constant current is a specific output current measured in milliamps or amps and has a range of voltages that change depending on how much the LED is being used (its wattage or load).

- **Constant-Voltage**

Constant-voltage LED drivers have a constant output voltage and a maximum output current. The LED module also has a regulated current system that a simple resistor or an internal constant-current driver can power.

They only need a single steady voltage, usually 12 or 24 volts DC.

- **LED Drivers For AC**

Theoretically, this LED driver could run halogen or incandescent lights with low voltage. But standard transformers can't be used with AC LED drivers because they can't tell when the voltage is low. So, they have transformers that don't have a minimum load.

- **Dimmable LED Drivers**

With these LED drivers, you can dim your LED lights. It also lets you control the brightness of LEDs with a constant voltage. And it does this by reducing the amount of current that goes to the LED light before it turns on.

Applications Of LED Drivers

- **Automotive LED Drivers**

With high-quality automotive LED drivers, you can tell the difference between your car's inside and outside lighting systems in many ways:

1. The group of headlights
2. infotainment
3. Interior and rear lighting

- Backlight LED Drivers

LCD backlight LED drivers often use a specific dimming scheme to control the backlight's brightness.

- **Illumination LED Drivers**

You can set up your devices with LED drivers to have infrared lighting. It can also be done with the help of a multi-topology constant-current controller.

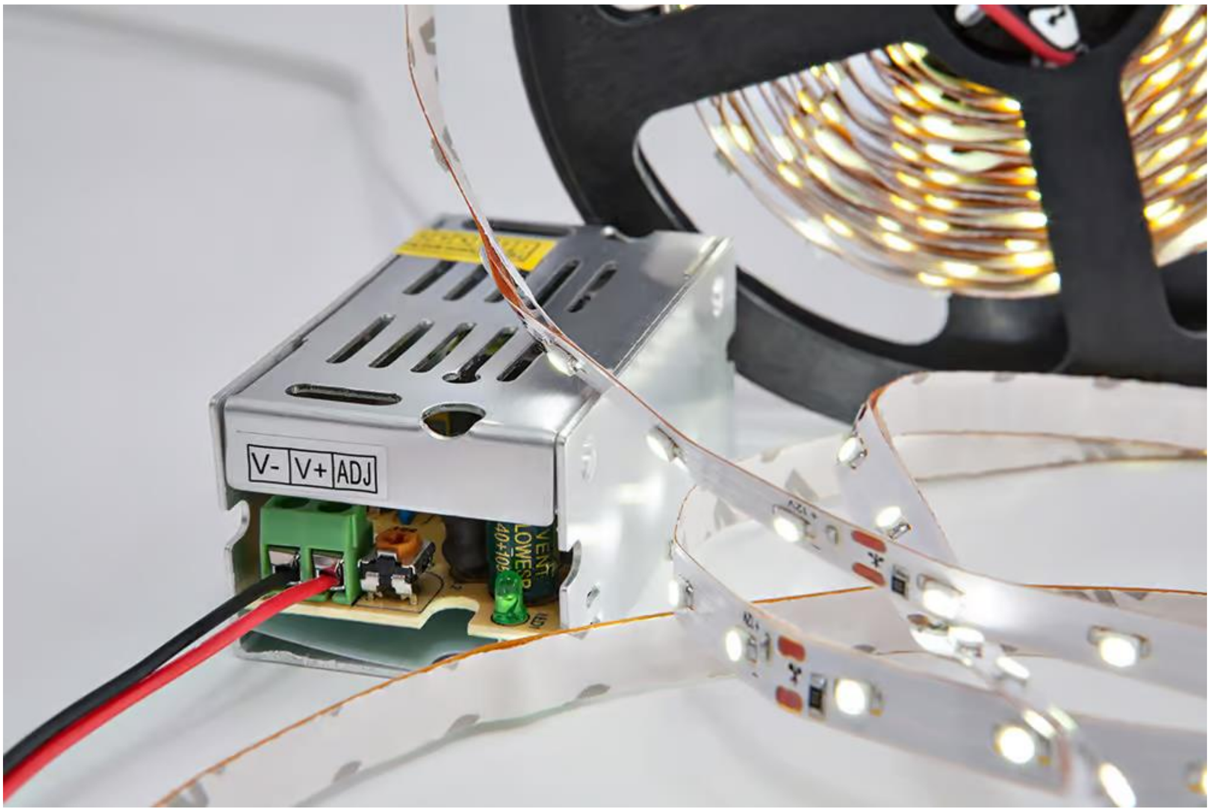
- **RGB LED Drivers**

With RGB LED drivers, you can add an animation or an indicator to your LED arrays with more than one color. Also, they often work with many standard interfaces.

- **Driver for LED displays**

With the help of LED display drivers, you can control which LED strings use the least and most power. So, these drivers can be used with either a large

narrow pixel or a matrix solution for small or mini LED digital signage applications.



LED Strip With LED Driver

What LED Driver Do I Need?

To figure out what size LED driver will meet your needs, you need to know the following:

1. The voltage of the mains power that you'll be using
2. The total amount of power that the system's LEDs use
3. What kind of voltage or constant current do the LEDs need

If there are any other technical factors, like the need for precise color control or the possibility of water exposure, that can affect how the LED drivers work. The LED's IP rating shows how resistant it is to water; a higher rating means it is more resistant. With an IP rating of 44, the product can be used in kitchens and other places where water might occasionally splash on it. A driver with a high IP rating, like 67, can be used outside. Drivers with an IP rating of 20 should only be used inside, where it's dry.

More information, you can read How To Choose the Right LED Power Supply.

The Ultimate Guide To 0-10V Dimming

Dimming is an innovative and flexible way to control light. Dimming lights is another way to save energy and create different moods. LED lighting is a big part of the lighting market and is expected to improve at dimming.

0-10V dimming is an analog method of dimming lighting fixtures that uses a control voltage signal to adjust the light output from 0 to 100%. The control signal ranges from 0 to 10 volts, where the name 0-10V dimming comes from.

Even though LEDs can be dimmed differently, 0-10V dimming is one of the most common ways to control lighting in commercial and industrial settings. If you're not sure if 0-10V dimming will work for your project. This blog post will give you the answer.

What Is 0-10V Dimming?

0-10V dimming is a way to control how bright the light is. It works on direct current voltage (DC) between 0 and 10 volts. The easiest way to control lighting is with 0-10V dimming, which allows for smooth operation and dimming down to 10%, 1%, and even 0.1% light level.

At 10 volts, the light will be at its brightest. At 0 volts, the light will dim to its lowest level, but a switch is sometimes needed to turn it off completely.

This easy-to-use lighting control system can be connected to LED lights for various lighting options and moods. Using a 0-10V dimmer, you can create lighting that fits your mood or activity by adjusting the brightness level. For example, making areas like bar and restaurant seating feel more elegant.

History Of 0-10V Dimming

0-10V dimming systems are also called fluorescent dimming systems or five-wire dimming systems. This dimming system was created when large systems needed a flexible way to turn down lights with magnetic and electrical blasts. So, all the lights can be turned down at once without changing anything but the bulbs. At the time, a 0-10V dimming system solved the big companies' problem.

These 0-10V dimming systems are still used, but as everything else in the world improves, these dimmers are becoming more popular with the newest and best lighting products such as LEDs.

The International Electrotechnical Commission (IEC) standard number 60929 Annex E is why this system is so well-known and widely used. Most companies and engineers agree with this standard.

How Does 0-10V Dimming Work?

LED drivers with 0-10V dimming have a circuit with a purple and gray wire that makes a 10V DC signal. When the two wires are open and don't touch each other, the signal stays at 10V, and the light is at 100% output level.

When the wires are touching or "shorted" together, the dimming signal is at 0V, and the light is at the lowest level of dimming that the driver has set. 0-10V dimmer switches lower the voltage or "sink" it so the signal can go from 10V to 0V.

Usually, the DC voltage matches the level of dimming of the driver. For example, if the signal is 8V, the light fixture is at 80% output. If the signal is turned down to 0V, the light is at its dimmest level, which could be between 10% and 1%.



Where To Use A 0-10V Dimmer?

0-10V dimming was made as a standard way to control fluorescent lights with light-dimming ballasts, and it is still often used in this way. With recent improvements in LED technology, 0-10V dimming has become a reliable and widely used way to control how dim LED lights are.

This system can dim LED fixtures in retail stores, office buildings, entertainment venues, theaters, and other commercial spaces. 0-10V dimming can also be used for commercial applications outside that need lighting that can be used for more than one thing. LED high bays, LED flood lights, LED strips, LED neon, and LED retrofit kits, to name a few, can be turned down.

Dimmable fixtures are often chosen for their ability to change the mood, but there are other reasons to use this type of lighting control system.

0-10V Dimming vs. Other Dimming Systems

There are several types of dimming systems available in the lighting industry, each with its own advantages and disadvantages. 0-10V dimming is a simple and widely used analog dimming technology that is compatible with many l

ighting fixtures and control systems, but has a limited control range and is susceptible to interference and noise. Other dimming technologies, such as DALI, PWM, wireless, TRIAC, and DMX, offer different benefits and drawbacks. For example, DALI provides precise and individual control of each lighting fixture, but can be more complex and expensive to install and operate than other systems. PWM provides flicker-free and efficient dimming for LED lighting applications, but may require special control equipment. Wireless systems offer flexible and easy installation, but may be susceptible to interference and hacking. TRIAC dimming is simple and low-cost, but can produce audible humming or buzzing. DMX provides flexible and programmable control, but requires specialized control equipment and software. A comparison of these different dimming systems can be seen in the table below:

Dimming System	Advantages	Disadvantages	Typical Applications
0-10V dimming	Simple to install and operate, compatible with many lighting fixtures and control systems	Limited control range, susceptible to interference and noise, requires a dedicated control wire	Simple dimming applications, retrofitting existing lighting systems
DALI	Precise and individual control of each lighting fixture, easy to integrate with building management systems	More complex and expensive to install and operate, requires special wiring and control equipment	Large commercial and industrial applications, high-end architectural lighting
PWM	Precise and flicker-free dimming, high efficiency, compatible with many LED fixtures	Can be complex to program, limited range of dimming, requires special control equipment	LED lighting applications, including high bay and outdoor lighting
Wireless	Flexible and easy to install, can be controlled remotely and programmatically, no wiring required	May be susceptible to interference and hacking, limited range of control	Residential and commercial lighting applications, smart home systems

TRIAC	Simple and low-cost, compatible with many lighting fixtures and control systems	Can produce audible humming or buzzing, may not be compatible with all LED fixtures	Residential and commercial lighting applications
DMX	Flexible and programmable, compatible with many lighting fixtures and control systems	More complex and expensive to install and operate, requires specialized control equipment and software	Stage lighting, theatrical productions, architectural lighting



What Do I Need For 0-10V Dimming?

Because of how LEDs work and how some drivers are made, not all [LED drivers] can be used with 0-10V dimmers. Ensuring your fixture has the right parts for a dimmer to work is essential.

In some cases, all you have to do to make an existing fixture dimmable is switch out the driver. In recent years, LED technology has come a long way, and now most commercial LED fixtures can be dimmed. Once you know if your fixture is compatible, you will need to run low-voltage wiring from the fixture back down to a compatible wall switch.

Are There Recommended Wiring Practices For 0-10v Dimming?

Your fixture’s driver can be a class one or a class two circuit, which means it either has no safety protection warnings or a significant safety protection warning.

When working with a class one circuit, it is important to handle the high-voltage output safely. Because the power is limited, there is no chance of getting an electric shock or starting a fire with a class two circuit driver. However, class one is often the most efficient because it can power more LEDs.

The source (driver) is usually connected to the dimming signal, which has a purple wire for +10 volts and a gray wire for the signal. When neither wire touches the other, the dimmer output will be 10 volts or 100%.

When they touch, the output from the dimmer control will be 0 volts. Its lowest level is 0 volts, and depending on the driver, the fixture will either go into sleep mode, turn off completely, or use a dimmer switch to turn it off.

It is best to keep the distance between the analog control wiring and the driver as short as possible when installing power or analog controls. As the National Electric Code requires, keeping all class two control circuits separate from class two line voltage wiring is essential.

The separation is vital because wiring with a higher voltage can send alternating current voltage to signals with a lower voltage. This can cause unwanted effects and safety problems with dimmed lights.



How To Install A 0-10V Dimming System

Here are the steps to install a 0-10V dimming system:

- Select the right tools: You' ll need a 0-10V dimming driver, a dimmer switch that works with the driver, and LED lights that work with the dimming system.

- Turn the power off: Turn off the power to the circuit you' ll be working on before you start the installation.

- Join the power source and the LED lights to the dimming driver.

- Connect the switch for dimming to the driver for dimming.

- Check to see if the system is working right.

Make sure to follow all the safety rules and instructions with your gear. Best wishes for your installation!

What Are the Benefits Of 0-10v Dimming?

Let’s discuss why you should choose 0-10V dimming and how it will help you.

- It is an advanced technology that works well with LEDs.
- It’s one of the easiest ways to use less electricity because a dimmer will let you control it.
- It will save you money and also extend the life of your LEDs.
- Since you can change its intensity, you can use your lights for multiple purposes. You will need a bright light for a sports field or other outdoor activities and dim light for places like a restaurant.
- It is very well-known on the market because it meets IEC standards.
- It can work well for business activities outside that need to dim the light.
- It works well in living rooms, bedrooms, and kitchens at home, as well as in restaurants, hospitals, warehouses, and offices at Work.

What Are The Limitations Of 0-10V Dimming?

Let’s look at the limitations of this technology because nothing is flawless, and there are both good and bad things about everything.

- The 0-10V dimming system and the primary dimming system are hard to combine.
- Not many companies make 0-10V dimming, so you may find it hard to get a good product.
- The drivers and blasts are what make these dimmers work. So you need the specs and guidelines to understand how these drivers will work.

- Voltage drop is a problem with a 0-10V dimming system. This is because the wires' resistance makes it so in an analog system.
- When installing 0-10V dimming, the labor and wire costs are higher.

Best Practices For Using 0-10V Dimming Systems

To use the 0-10V dimming system properly, the best practices you should use are

- Use compatible equipment: Use equipment only that works with your 0-10V dimming system. This includes LED lights, dimming drivers, and dimmer switches.
- Follow the wiring diagrams: Wire the system correctly by following the diagrams that come with the equipment. Use the correct wire sizes and connectors to ensure connections are safe and work well.
- Test the system: Before you use it, ensure it works right by testing it. Check that the dimming range is smooth and even and that the lights don't buzz or flicker.
- Use appropriate loads: Only use loads that are right for the dimming system. Don't put too much load on the system, like too many lights or a big load.
- Control voltage drop: Keep an eye on voltage drops, which can happen over long distances or when using multiple loads. Use the proper wire sizes and follow the instructions in the equipment manual or from the manufacturer.

Using these best practices, you can ensure your 0-10V dimming system is safe, reliable, and meets your needs.

Troubleshooting 0-10V Dimming Systems

0-10V is easy to troubleshoot compared to other ways of dimming, let’s take a look at various issues that may appear with 0-10V dimming and how you can fix it.

- **Driver And Dimmer Issues**

If the light fixture doesn’t work well with a dimmer, the dimmer or driver may be broken. First, make sure the driver functions as it should. The dimmer and LED driver are connected by two low-voltage control wires.

Take the wires out of the circuit and briefly touch two of them together. If the light goes down to the lowest brightness level, the driver is fine, and there may be a problem with the dimmer or the wires. If not, the driver isn’t working how it should. You could fix the problem if you changed the driver.

- **Noise Due To Wires Issues**

If the light fixture makes noise when you turn it up or down, pay attention to the wires. The AC power cables near the 0-10V DC wires may be making noise. A dimming fault will also happen if the wires aren’t correctly positioned.

The problem could be caused by the fact that the 0-10V DC wires are near AC wires or are put in the same conduit as AC wires. The noise is often a sign that the installation was wrong, so we should check to see if the light-dimming system works properly after the first installation.

- **Improper Dimming Range**

Not all 0-10V dimmers can give drivers the full range of 0-10V because some dimmers may not be compatible with drivers. Make sure the dimmer works with the driver by looking at the lists of compatible dimmers that the driver manufacturers and the light fixture have made.

When you connect 0-10V dimmers to a 1-10V driver, flickering, stuttering, and flashing will happen in low dimming control. The problems are easier to see when the on-off setting is used. The light fixture can’t be turned off entirely without cutting power.

Adding 0-10V dimming to a lighting system can change the light intensity, and less energy is used.

Future of 0-10v dimming

0-10V dimming is a method that has been around for a long time, and it has been a reliable and cost-effective way to change the brightness of light fixtures for many years. But what will happen to it?

As the lighting industry has grown, new control methods have emerged. Voice-activated systems, Bluetooth, and wireless controls have all caught the attention of both designers and users. Still, these new technologies can be hard to use and expensive and may not be helpful in all situations.

Even though these new technologies are becoming more popular, 0-10V dimming is likely to still be used. Many lighting companies still make fixtures that work with this method, and it’s still a simple and reliable way to control the amount of light.

Even though the lighting industry may continue to change, 0-10V dimming will likely be a useful and inexpensive option for many uses.

Efficient LED Control: Exploring PWM Dimming

LED lighting is widely used because of its effectiveness, durability, and long lifespan. One of the trickiest things about utilizing LEDs is controlling their brightness. Here, PWM dimming is relevant. control of LEDs PWM dimming is a method for regulating LED brightness by altering the pulse width of the electrical current. PWM dimming is becoming more and more well-liked as a practical and effective method of controlling LED lights.

What is PWM dimming?

PWM’s ability to control a variety of devices in each field of electronics is largely responsible for its widespread use in the modern electronics industry. PWM signals are used to dim LEDs, control motors, and run an assortm

ent of different electrical equipment. Hence, what is the functionality of the PWM methodology?

PWM is a method for reducing the average deliverable power of an electrical signal. In addition, the procedure is completed by successfully separating the signal into its constituent parts. In terms of functionality, the switch between the load and the source may be swiftly turned on and off to regulate the average current and voltage supplied to the load.

By varying the amount of time the signal is high (ON) or low (OFF), PWM allows for a wide range of brightness (OFF). In contrast to analog dimming, which dims LEDs by altering output power, the PWM signal may either be ON or OFF at any one time, meaning that the LEDs will either get the full voltage or no electricity (i.e., providing 10V instead of 12V to alter brightness).

What is Constant Current Reduction (CCR)?

The continuous current reduction technique provides a steady current flow to the LED (CCR). In contrast to the PWM method, in which the LED state fluctuates between on and off, the LED is constantly on. Yet, you may control the LED’s brightness by adjusting or changing the current levels using CCR.

Advantages of the CCR Dimming Method:

- Ideal for remote applications that require long wire lengths and stringent EMI specifications.

- CCR drivers have higher output voltage restrictions (60 V) than PWM drivers (24.8 V). These specifications apply to Class 2 drivers that are UL-certified for use in both moist and dry environments.

Disadvantages of the CCR Dimming Method:

- LEDs’ inconsistent light generation at very low currents renders the CCR method inappropriate for applications requiring dimming below 10% of maximum brightness. In conclusion, the LED performance produced by this method at these present levels is subpar.

- Low driving current leads to an inconsistent hue.

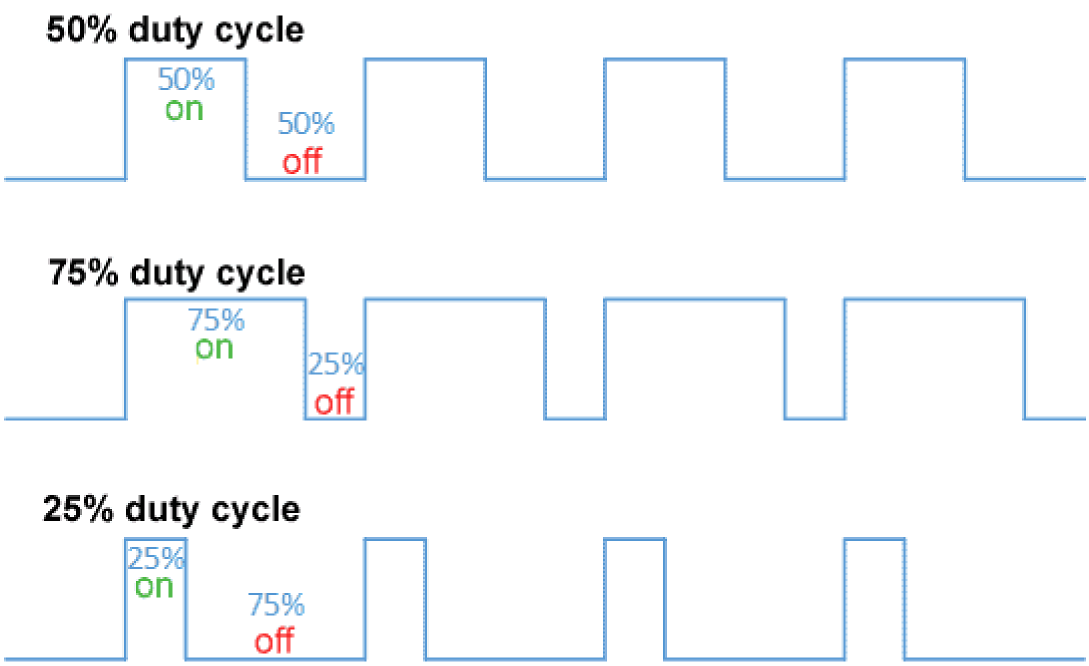
PWM as A Dimming Signal

Let’s expand on our current understanding of pulse width modulation. Now, the PWM must be recognized as a signal.

Pulse width modulation signals consist of sequences of square-wave-shaped pulses (PWM). There are peaks and valleys in the waveform of every signal. The on-time is when the signal strength is high, whereas the off-time is when the signal strength is low.

Duty Cycle

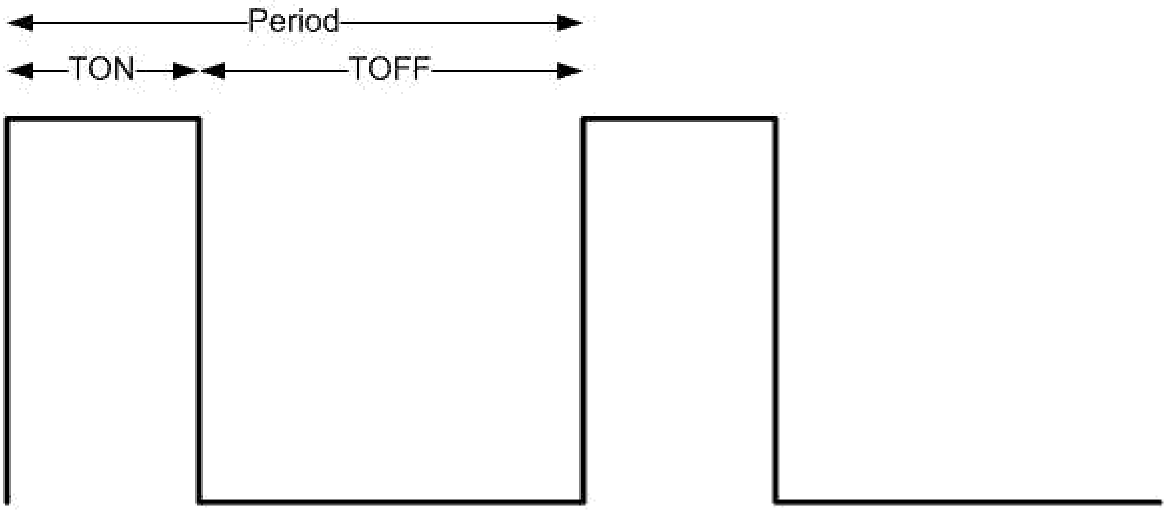
The duty cycle is when the signal can remain high in the dimming concept. Hence, the signal has a 100% duty cycle if it is always on. The PWM signal’s on-time can be adjusted. When the PWM duty cycle is set to 50%, the signal runs 50% of the time on and 50% off.



Frequency

The pulse width modulation (PWM) signal frequency is another essential component. The PWM frequency determines how quickly a period—the amount of tim

e it takes for the signal to turn on and off—is completed by the PWM signal.



Period = TON + TOFF

Frequency = 1 / Period

PWM as LED Driver Output

When the PWM signal is converted to a DC voltage and used as an LED driver output, pulse width modulation occurs. The PWM output circuit cuts the DC LED currents between the on and off states at a high frequency. Hence, the flicker that causes a shift in the LED light output is invisible to the human eye.

People frequently confuse a few things regarding the distinctions between PWM output and dimming signal. So let’s take note of a few things.

The mechanism produces a PWM signal as a digital signal, which makes it consistent on the dimmable cable. In contrast, the driver determines the output current by detecting the PWM duty cycle.

PWM Dimming Drivers in the Market

PWM dimming drivers are becoming increasingly crucial for LED lighting. Nonetheless, it is necessary to know that PWM dimming drivers might be realized in two different ways, and let’ s find out what they are.

Fake PWM Dimming

The purpose of the fake dimming method is to convert PWM inputs into an analog control signal. A resistor-capacitor (RC) filter resides within the driver.

The RC filter converts the PWM signal to a proportional DC voltage based on the duty cycle. Fake PWM dimming has the advantage of being noiseless, and there is no noise at the output because the LED current is continuous.

Nevertheless, this method is problematic since the precision is poor if the PWM’ s peak value is below 10V. Moreover, the resistor-capacitor (RC) value limits the frequency of the PWM signal.

Real PWM Dimming

In real PWM dimming, LED currents switch on and off at the frequency and duty cycle specified. The presence of the MCU or microcontroller in the driver enables the PWM signal to detect peak voltages. Real PWM dimming supports a broader spectrum of PWM frequencies.

A fundamental feature of PWM dimming is its ability to maintain the white point of the LED output. In addition, an elevated reference voltage level exceeding offset errors is permitted.

The driver development software requires users to pick PWM dimming mode.

Altering the Duty Cycle (brightness) With PWM

While the supply is switched ON and OFF so rapidly utilizing pulse width modulation output, the LEDs do not flicker. Duty Cycle is the term used to describe the measurement of PWM brightness.

The duty cycle is the proportion of the circuit’ s runtime that it is ON. The duty cycle is expressed as a percentage, with 100 percent representing the brightest feasible condition (fully ON) and lower percentages resulting in poor LED light output.

The PWM signal has a 50% duty cycle if it is on 50% of the time and off 50% of the time. The signal appears as a square wave, and the brightness of the lights should be about average. When the percentage is greater than 50%, the signal spends more time in the ON state than in the OFF state, and vice versa when the duty cycle is less than 50%.

Pulse Width Modulation (PWM) vs. Analog Dimming of LEDs

With the exponential growth of LED lighting on the market, there has been a natural rise in demand for highly efficient and precisely regulated LED drivers. To preserve the energy-efficient strategy and end-use flexibility of LED design, “smart” street lights, flashlights, and digital signs, among other uses, require precisely controlled currents and, in many cases, dimming functionality.

PWM Dimming

With pulse width modulation (PWM) dimming, the LED current is momentarily on and off. To prevent a flickering effect, the on/off frequency must be quicker than what the human eye can perceive (usually over 100Hz). PWM dimming can be implemented via a variety of methods:

- Using a PWM signal to change voltage directly.
- By way of an open collector transistor
- By a microcontroller.

The average current of an LED is equal to the sum of its total nominal current and its dimming duty cycle. The designer must also take into account the delays in converter output shutdown and startup, which impose limitations on the PWM dimming frequency and duty cycle range.

Analog Dimming

Adjusting the LED current level is referred to as analog dimming. Using an external DC control voltage or resistive dimming can accomplish this. Despi

te the fact that analog dimming now allows for level adjustment, the color temperature can shift. Analog dimming is not recommended for applications where the hue of the LED is essential.

Let’s take a look at the primary differences between PWM & analog dimming

PWM Dimming	Analog Dimming
Brightness is adjusted by modulating the peak current in the driver	Brightness adjusted by changing the DC going to the LED
No Color Shift	Possible Color Shift as LED current changes
Possible current inrush problems	No inrush current to device
Frequency limitations & possible frequency concerns	No frequency concerns
Very linear change in brightness	Brightness linearity not as good
Lower Optical to electrical efficiency	Higher optical to electrical efficiency(>lumens per watt consumed)

Hardware Considerations For PWM

PWM dimming requires certain considerations when developing the system (or PC board).

A driver is typically necessary with backlight-type LEDs due to the current level. A digital output, like one from a microcontroller, cannot be used to drive it directly.

A straightforward logic level FET (Field-Effect Transistor) type transistor is typically utilized as a driver in various applications. A resistor on the gate must be used to switch the FET to control the gate current, and a resistor is necessary if the current restriction is desired. Make sure you lo

ok up the proper backlight driving voltages and currents on the LCD datasheet.

A switching-type LED driver may drive the LED backlight at higher currents and more efficiently. These drivers are more complicated, and a specialist IC often handles the switching function. The PWM input on several ICs is designed expressly for dimming applications.

If a microcontroller is being used, care should be taken to connect to an output pin that supports PWM (timer/counter) output if PWM is used as a hardware function.

PWM - Firmware/Software Considerations

PWM dimming demands particular system design considerations (or PC board).

Because to the high current, backlight-type LEDs typically require a driver. Digital outputs, such as those from microcontrollers, cannot be utilized to directly drive it.

Typically, a simple logic level FET (Field-Effect Transistor) type transistor is used as a driver in a variety of applications. Switching the FET to regulate the gate current requires a resistor on the gate, and a resistor is required if current limiting is desired. Check the LCD datasheet for the correct backlight driving voltages and currents.

A switching-type LED driver may drive the LED backlight more effectively and at greater currents. These drivers are more complex, and the switching function is frequently handled by a specialized IC. Several ICs' PWM inputs are developed specifically for dimming applications.

If PWM is utilized as a hardware function, attention should be made to connect to an output pin that supports PWM (timer/counter) output on a microcontroller.

PWM Functionality And Applications

When the on and off periods of the switch are shifted relative to one another, the amount of electricity delivered to the load rises. As expected, this type of control offers many advantages.

PWM paired with maximum power point tracking, or MPPT, is one of the primary ways for reducing solar panel output to make it easier for a battery to use it.

PWM, on the other hand, is ideal for powering inertial equipment, such as motors, because this unique switching has less of an effect on them. Due to the linear link between LEDs' functioning and input voltage, this also applies to LEDs.

In addition, the PWM switching frequency must have no effect on the load, and the resulting waveform must be smooth enough for the load to recognize.

Depending on the device and its function, the switching frequency of the power supply will typically vary significantly. Electric ranges, computer power supplies, and audio amplifiers all require switching speeds in the tens or hundreds of kilohertz range.

Another key advantage of adopting PWM is the incredibly low power loss in switching devices. When a switch is turned off, no current flows through it. In addition, when a switch is on and sending electricity to its load, there is a negligible voltage drop across it.

Everything you need to know About Triac Dimming for LEDs

You can't go anywhere in the world today without coming across an LED light fixture. LEDs are great at saving energy. However, LEDs are not yet on par with traditional incandescent light bulbs in terms of color depiction and dimming.

Dimmers with thyristor integrated circuits (TRIACs) are replacing compact fluorescent light bulbs. LEDs, and halogen lamps in residential settings where incandescent light bulbs are still used. Triac is commonly used in these types of systems.

For LED lighting to be viable, it must be both energy efficient and last a long time. It can control high-power devices even though it is made of chea

p parts. So, we can say that TRIAC is a good choice for lighting and other large-scale electrical equipment that we require to work reliably.

What Exactly is A Triac?

A TRIAC is an electronic component with three terminals that can conduct current in either direction when it is turned on. This configuration is equivalent to two SCRs with their gates wired in reverse parallel and connected to each other.

A TRIAC is activated by a gate signal that is analogous to that of a silicon carbide (SCR). Due to the gate signal, the gadget can accept current in either direction. TRIACs were developed to facilitate the management of AC power.

You can choose from a wide variety of TRIAC packaging options. TRIACs are completely safe to be subjected to a broad variety of voltages and currents without fear of harming them. Most TRIACs have a current rating of less than 50 A, far lower than that of silicon controlled rectifiers. Therefore, they are inapplicable wherever high currents might cause damage.

TRIACs' are versatile as a device that can operate with either a positive or negative voltage across its terminals that makes them a handy tool. This provides a great deal of flexibility for future redesigns. Since SCRs allow current to flow in both directions, they are not as effective as TRIACs at managing low power in AC circuits. It's easier to use the TRIACs.

How Does The Triac Dimming Work?

From AC phase 0, physical dimming occurs when the input voltage is dropped until the TRIAC dimmer is turned on. This continues until the output voltage reaches the desired level. Changing the effective value of the AC is how this dimming system gets its job done. Altering the angle of conduction for each AC half-wave is the first thing that needs to be done.

TRIAC dimming controllers perform in the same manner as quick switches. These are what are utilized to regulate the amount of current that is passing through an LED lamp. When a device is powered on, it will begin to move electrons through its internal components.

Typically, it accomplishes this by severing the voltage waveform and stopping the flow of electricity. When the load reaches its maximum capacity.

Adjusting the intensity of the lights is one of the many functions that a TRIAC controller for LED lighting can perform. Because the switch takes longer to react, there will be less power flow, and as a result, the bulb’s brightness will be reduced.

The total amount of energy that has been freed can be estimated by how fast the switch responds. A large amount of energy is lost whenever a switch has a rapid response time.

Because of its poor response time, it restricts the amount of energy that may be used. As a consequence of this, the LED light will lose some of its brightness. Due to the fact that TRIAC dimming reduces the likelihood of half-wave on failure and Hz flicker.

It does not affect the life of LED bulbs to the same extent as Thyristor dimmers, which are the type that are used.

Through the application of voltages that are diametrically opposed to one another on the TRIAC’s gate electrode.

Controlling the flow of electricity is something that can be accomplished. Power can flow through the TRIAC once it has been activated, but only up until the point when the current falls below the safe level.

The circuit is capable of handling high voltage. Yet the control currents that are required are low. It alters the amount of current that travels through a circuit load. It can be accomplished with the use of a TRIAC circuit and a phase control.

When using an LED bulb with a TRIAC dimmer and seeking for a TRIAC dimming LED driver you will need to do the following. It is important to make sure that the TRIAC dimming device in question is, in fact, a TRIAC semiconductor device.

There is more than one TRIAC dimmer that can be constructed for resistive loads. When an LED light source is combined with a TRIAC dimmer in an inappropriate manner. There is a possibility that the light bulb does not functio

n properly, as evidenced by humming or flickering. It is possible that the lifespan of LED lights will be reduced if these issues are not resolved.

Why Choose TRIAC?

TRIACs can switch high voltages. The TRIAC is a helpful component that may be found in a wide variety of electrical control systems. According to these findings, the concept that a TRIAC can be used to switch lights. It can be used in the same way that we do on a daily basis is supported by evidence.

TRIAC circuits can be used in a variety of ways to control and switch AC electricity. For instance, you can use them to power small motors and fans. Users can do a lot with TRIAC because it is a simple protocol and a control that can do more than one thing.

What is Dimming?

To change the amount of light and the mood, all you have to do is flip the switch on the dimmer. There are now many kinds of available dimming drivers.

Dimming drivers can be divided into several categories. These are Triac dimmers, LED dimmers with a voltage range of 0 – 10 V, and pulse width modulation (PWM) dimmers.

Each of these methods changes the output of current, voltage, and frequency. Each method in different ways to change the amount of light coming from the source.

Triac Dimming

Dimming with a triac was first made for incandescent and compact fluorescent bulbs. But now it is used a lot with LEDs as well. Because triac dimming is a physical process.

Triac dimming starts with AC phase 0 and goes on until the Triac driver is triggered at which point the input voltage drops by a lot. The voltage input waveform is cut at the conduction angle. This makes a voltage waveform that is perpendicular to the voltage input waveform.

Use the tangential direction principle to reduce the amount of power needed to run the common load. This brings the effective value of the output voltage (resistive load) down to a lower level.

The Triac dimmer is the standard in the industry because it has a lot of great features. Features such as precise change, high efficiency, small size, light weight, and easy operation from a long distance.

As a result, it has become the default choice for manufacturers. Dimming with a triac has many benefits. Benefits such as a low initial investment, reliable operation, and low ongoing cost.

PWM Dimming

PWM stands for “pulse-width modulation”. It is a way to control analog circuits that uses the digital output of a microprocessor. This method is very effective.

This method is used in many fields. It is used in measuring, communications, power control and conversion, and LED lighting, to name a few. By switching analog equipment to digital control, the cost of the system and the amount of energy it uses can be cut by a large amount.

Digital control is also easier to use. That is because most modern microcontrollers and DSPs have PWM controllers built right into the chip. This makes digital control more convenient in general.

Taking a pulse-width modulation (PWM) reading is a straightforward method of logging the intensity of an analog signal. When attempting to determine the intensity of an analog signal. Using high-resolution counters, one can manipulate the square wave’s duty cycle.

In spite of the fact that the full-scale DC supply may or may not be present at any one time, the PWM signal remains digital. A voltage or current source that cycles on and off at regular intervals is provided to the analog load.

The load is connected to the DC power supply whenever the latter is operational. Once you turn it off, communication stops.

With proper frequency bandwidth, any arbitrary analog value can be encoded using pulse width modulation (PWM). For your perusal, a schematic depicting three distinct PWM signals is provided below.

LED 0/1-10v Dimming

A 0-10v dimming system is an analog dimming method because the driver has two extra ports for +10v and -10v. A traditional Triac dimmer only has one port for +10v and -10v.

The effect of dimming can be achieved by controlling the current that the driver sends out. That is what makes it possible. In this case, 0V is pitch black and 10V is quite bright. On the resistance dimmer, the output current is 10% when the voltage is at 1V, and it is 100% when the voltage is at 10V.

In contrast to 0 - 10V, which has an on/off switch built in, 1 - 10V does not, so the light cannot be turned off completely.

Dali Dimming

To wire DALI dimming, you need a control cable with two cores. After the initial installation is done,the lighting management systems make it possible to digitally rewire the lighting circuits.

while staying within the parameters that have already been set. With DALI lighting, LED downlights, LED accent lights, and LED linear systems will all have the best possible control over their light sources.

Even better, no other form of modern dimming technology can match the range of dimming that can be done by these systems. Because of these changes, more recent versions of DALI can be used to control both RGBW and Tunable White lighting.

Dimming ballasts that use the DALI standard can easily handle even the most complicated color-changing applications.

TRIAC Controller & Receiver

TRIAC controllers let you change many aspects of the lighting. They achieve the effect of a dimmer setting by quickly reversing the flow of electricit y, which is how they work.

It applies to LEDs and other forms of lighting technology in the same way.

TRIACs are usually used in high-power situations, such as when lighting, he ating, or controlling motors. TRIACs are used to turn electricity on and of f more quickly than regular power switches. It helps cut down on noise and EMI that would otherwise be present.

You are able to modify the quantity of power that is sent to a load by maki ng use of a TRIAC receiver. In order to accomplish this, it maintains a tig ht watch on the voltage that is present between the terminals of the TRIAC and activates the load.

It is done when that voltage reaches the threshold that has been set.

This receiver can be used in a variety of different ways. Some examples of these are adapters for power outlets, throttles for motors, and dimmers for lights.

The TRIAC receiver is used in a broad variety of industrial equipment, incl uding plasma cutters and welding equipment, amongst others.

TRIAC Dimmers Used in LEDs

Light-emitting diodes, also known as LEDs, are gaining popularity as a ligh ting option due to their low energy consumption, long lifespans, and high l evels of efficiency.

One of the few disadvantages of LEDs is it can be difficult to adjust the l evel of brightness. The intensity of LED lighting can be adjusted with a TR IAC dimmer.

TRIAC dimmers change the load current to make changes to the lighting. They do this by quickly switching between active and inactive states. This bring s the average current down to a level where it can be safely handled. Due t

o this, they are an excellent option for usage in situations requiring LED dimmers. Since they are not affected by quick changes in current.

When working with LEDs, TRIAC dimmers provide a few one-of-a-kind problems that need to be addressed.

Before you install an LED, you should first check to see if the dimmer can be used well with it. Checking the current rating of the dimmer is the second step in making certain that the dimmer is capable of managing the amount of power that the LED will consume. Third, you need to make sure that the dimmer and the LED are linked properly by wiring them together.

TRIAC dimmers are an excellent tool for reducing the amount of light that your LED lights produce if you follow the instructions provided above. The brightness can be easily changed, and there is no flickering or other annoying effect.

In addition to everything, they are compatible for use with a diverse selection of LED light fittings and bulbs.

What is Leading Edge?

Traditionally, incandescent and halogen light bulbs have been used with these dimmers. Since these dimmers were made to work with incandescent light bulbs, they need a lot of power to work. Because of this, their value is limited when combined with low-energy lights like LEDs.

USING LEADING EDGE DIMMERS WITH LEDS

Due to the fact that LED lights use so little power, they might not meet the minimum load requirements of cutting-edge dimmers.

Because of the demanding minimum load requirements of a leading-edge dimmer. You won’t be able to get the effect you want by using just one of these dimmers with a single LED light string.

LEDs use less energy than other types of lighting, so they can give off more light while using a lot less power. With today’s high-tech dimmers, it would be possible to make more light than is actually needed.

To dim lights with lower wattages, such as LEDs, you should make use of a trailing edge dimmer rather than an earlier style of dimmer switch. This is the case since trailing edge dimmers are more efficient. This happens because trailing edge dimmers are more sensitive to small changes in voltage.

What is Trailing Edge?

The newer leading-edge dimmers are better in a number of ways than the older leading-edge versions.

The fade-out is now much more quiet and slow, and there is much less buzzing and interference because of these changes.

Minimum loads for trailing-edge dimmers are much lower than those for leading-edge dimmers.This makes them better for powering LEDs.

USING TRAILING EDGE DIMMERS WITH LEDS

When dimming LED lights with a trailing edge dimmer, the 10% rule needs to be followed. It’ s true that a trailing edge dimmer with 400W of capacity can easily handle 400W of incandescent bulbs, but the most LEDs can handle is just 10W. That is to say, our 400W dimmer can only control a maximum of 40W of LED lights.

Low-wattage loads are most effectively managed by trailing-edge dimmers. Since you don’ t have to worry about the large minimum load that leading-edge dimmers require, you can use as many LEDs as you want to get the effect you want.

Differences Between Leading-edge and Trailing-edge Dimmers

Leading-edge dimmer switches were used to dim incandescent, halogen, or wire-wound magnetic transformers.

This was done because leading-edge dimmer switches were easier to install. It also costs less to buy than trailing-edge dimmer switches.

Because of a TRIAC switch, also known as a "Triode for Alternating Current" switch, which is utilized to regulate the quantity of electricity that is utilized. Which is another name for these devices is "TRIAC dimmers."

Because they have a high minimum load. The leading-edge dimmer switches that are currently used are not compatible with lighting circuits that use low-power LEDs or CFLs. But the type of dimming control that is the most popular right now is the most recent one.

The functionality of trailing-edge dimmers is more complex than that of their leading-edge counterparts. Because they are quieter and smoother, they can be used in most types of buildings.

Because it has a lower minimum load, a trailing-edge dimmer is better than a leading-edge dimmer. For dimming lighting circuits with smaller, less powerful bulbs.

What is A Dimming Curve?

The dimming curve is the name given to a parameter that the dimming device would usually list as it worked. After processing the input signal, a dimming device will usually make the light output match a function that has been set up ahead of time.

This will happen after the device has handled the signal. As an example of the function, the fading curve can be seen in this figure.

When looking to buy dimming equipment, this is one of the most important things to think about. It has an immediate effect on the effect that the light output has. It is also the physical representation of how the digital dimming equipment works.

Types Of Dimming Curve

Based on how they look, dimming curves can be separated into a number of different types. We' ll talk about the linear dimming curve and the logarithmic dimming curve. Both are main types of dimming curves (sometimes called "square-law" dimming).

When using linear dimming curves, the amount of light that comes out is directly related to the amount of energy that goes into the system. The strength of the input signal, which in this case is 25%, will be exactly the same as the output value.

So, when logarithmic dimming curves are used, the values of the inputs change as the dimming levels go up. When the brightness is lowered, the signal sent to the driver will change more slowly. But when the brightness is raised, it will change more quickly.

A dimmer, which is an input device, or a driver, can have any curve programmed into it, such as a “S” curve, a “soft linear” curve, etc (an output device). This type of input range, which is also called a “slider,” is usually meant to give you more precise control over a portion of the total input range.

If, on the other hand, you tell the makers of architectural products that you want “linear” or “logarithmic” for all the input and output devices, then you can expect the best possible results.

TRIAC LED Control System And Its Wiring

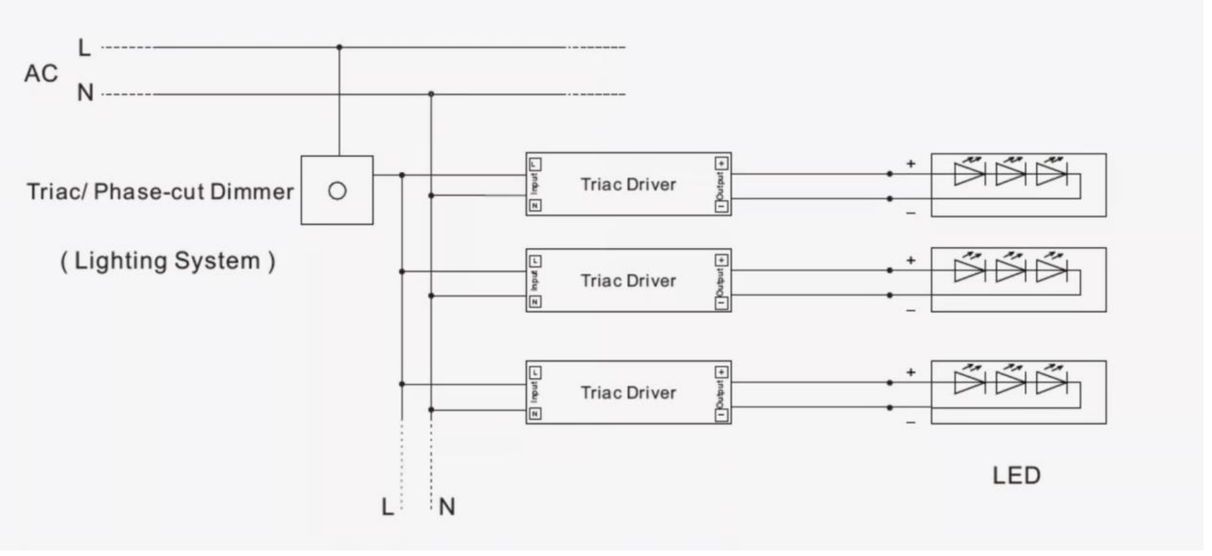
Simply adding a TRIAC into the circuit will allow the brightness of an LED to be adjusted to the desired level. The TRIAC is a semiconductor device with three terminals. To turn it on, a voltage must be applied to its gate terminal. It can be turned off when the voltage is removed from that terminal.

Because of this, it is a great choice for the task in question. Which involves precise management of the current that is flowing via an LED.

Before you can begin installing a TRIAC dimmer in your house, you will first need to remove the standard light switch that is currently there.

It is necessary to make a connection between the black wire that is coming out of the wall and the black wire that is coming out of the dimmer. Following this step, you will need to connect the white wire of the dimmer to the white wire that is already present in the wall.

At last, you are able to make the connection between the green ground wire on the dimmer and the bare copper ground wire that is located in the wall.



Advantages And Disadvantages Of TRIAC Dimmers In LEDs

TRIAC dimming has many benefits. benefits, such as a high degree of efficiency. It also gives a high level of adjustment precision. It provides a light-weight construction. It also has a tiny and compact size and an easy-to-use remote control, which are some of the benefits of this product.

The TRIAC dimming method is the most common type of dimmer you can buy right now. There is a wide range of products that are made using this method.

One of the many advantages of utilizing these dimmers is the fact that they have a low dimming cost when utilized in conjunction with LED lighting. This is one of the advantages of using these dimmers.

Because of how poorly it dims, a TRIAC dimmer has a limited dimming range. This limits the dimmer's overall range of motion. Using this kind of dimmer has this drawback.

There is still a very slight amount of current going through the TRIAC switch even when it is turned down to its minimum setting. This is because the TRIAC switch's function is to start electrical flow. With the way LEDs are dimmed right now, this is a tough problem that needs to be solved.

Everything You Need to Know About DALI Dimming

The Digitally Addressable Lighting Interface (DALI), was made in Europe and has been widely used there for a long time. Even in the U.S., it’s getting more and more popular. DALI is a standard for digitally controlling individual light fixtures using a low-voltage communication protocol that can both send data to and receive data from the lights. This makes it a useful tool for building information monitoring systems and controls integration. Using DALI, you can give each light in your home its own address. You can have up to 64 addresses and 16 ways to divide your home into zones. DALI communication is not affected by polarity, and it can be set up in many different ways.

What is DALI?

DALI stands for “Digital Addressable Lighting Interface.” It is a digital communication protocol to manage lighting control networks in building automation projects. DALI is a trademarked standard that is used all over the world. It makes connecting LED equipment from many manufacturers easy. This equipment can include dimmable ballasts, receiver and relay modules, power supplies, dimmers/controllers, and more.

DALI was made to improve the 0-10V lighting control system by adding to what Tridonic’s DSI protocol could do. DALI systems let the control system talk to each LED driver and LED ballast/device group in both directions. Meanwhile, 0-10V controls only let you talk to them in one direction.

The DALI protocol gives LED control devices all the commands. DALI protocol also gives communication channels they need to control building lighting. It is also scalable and can be used for simple and complicated installations.

Why choose DALI?

DALI can help designers, building owners, electricians, facility managers, and building users control digital lighting more effectively and flexibly.

As a bonus, you can be sure it will work perfectly with lighting equipment from many companies.

In the most straightforward setups, like single rooms or small buildings, a DALI system can be a single switch that controls many LED lights powered by a DALI-compatible power supply. So, there is no longer a need for separate control circuits for each fixture, and setting up takes the least amount of work possible.

LED ballasts, power supply, and device groups may all be addressed using DALI. That makes it ideal for large buildings, office complexes, retail spaces, campuses, and similar settings where space and use needs are subject to change.

Some other benefits of controlling LEDs with DALI are as follows:

1. Facility managers would benefit from being able to check on the status of each fixture and ballast. It takes a lot less time to fix things and replace them.

2. Because DALI is an open standard, it is easy to combine products from different manufacturers. It also helps to upgrade to better technology as it becomes available.

3. Centralized control and timer systems make it possible to make lighting profiles. Best for ease of use, peak demand, venues with more than one scene, and saving energy.

4. DALI is easy to set up because it only needs two wires to connect. Installers don’t have to be skilled because you don’t have to know how the lights will be set up in the end or label and keep track of the wiring for each fixture. The input and output are both done with two cables.

How to control DALI?

Standard light bulbs and fixtures are used in DALI installations. But the ballasts, receiver modules, and drivers differ. These parts connect DALI’s two-way digital communications, which can be set up in many different ways,

to a central control system, which can be anything from a laptop to a high-tech lighting control desk.

Centralizing fixed light switches makes it possible to control a single light or the whole lighting circuit (aka a lighting zone). When the switch is flipped, all the lights in the same "group" are told to turn on or off simultaneously (or the brightness is adjusted).

A basic DALI system can take care of up to 64 LED ballasts and power supplies (also known as a loop). All the other devices connect to the DALI controller. Most of the time, several separate loops will be linked together and run as one extensive system to control the light over a larger area.

What is a DALI bus?

In a DALI system, control devices, slave devices, and the bus power supply connect to a two-wire bus and share information.

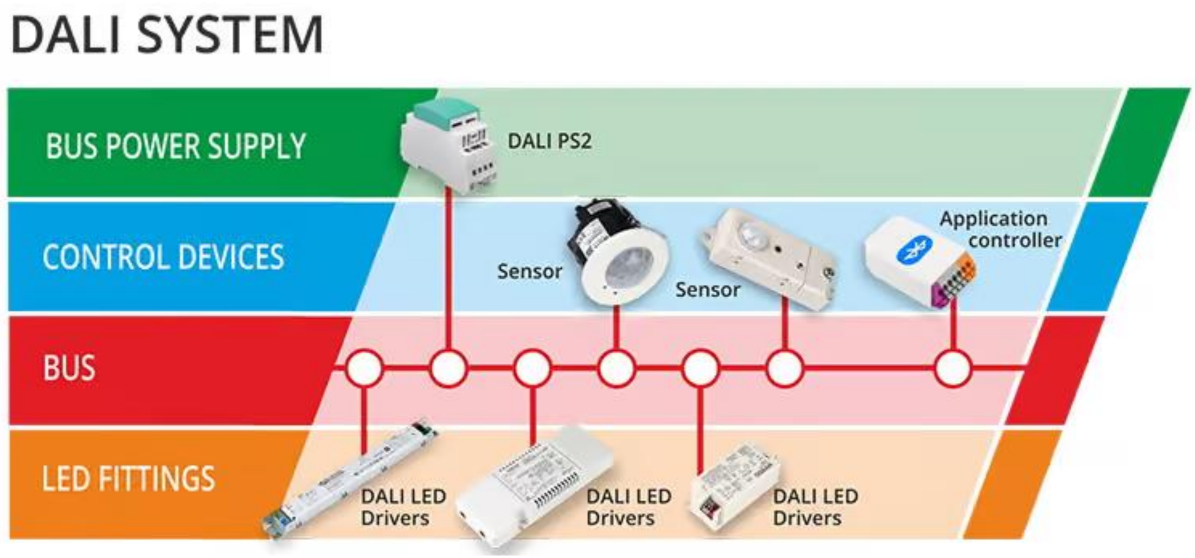
- The hardware that runs your LEDs is called "control gear," It also gives your LEDs their light.

- Slave devices, which are also called "control devices, "These devices include both the input devices (like light switches, lighting control desks, etc.). They also include application controllers which analyze input and send the necessary instructions. They do it to adjust power to the appropriate LED.

- You need to power the DALI bus to send data. So bus power supplies are essential. (using round 16V when there is no communication, more when instructions are being communicated).

Interoperability criteria are part of the current DALI standard. This lets certified products from different manufacturers work together on the same DALI bus.

On a single DALI bus, control devices and control equipment can each have up to 64 addresses. A "network of networks" comprises several buses that work together in more extensive systems.



Key features of DALI

1. It is a free protocol, so any manufacturer can use it.
2. For DALI-2, certification requirements ensure that devices made by different companies will work together.
3. Setting it up is easy. You can lay power and control lines next to each other because they don't need to be shielded.
4. The wiring can be set up in the shape of a star (hub and spokes), a tree, a line, or a mix of these.
5. Because you can use digital signals for communication instead of analog ones, many devices can get the same dimming values, which makes dimming very stable and accurate.
6. The system's addressing scheme ensures that each device can be controlled separately.

Compatibility of DALI products with each other

The first version of DALI didn't work well with other systems. It didn't work because the specification was too narrow. Each DALI data frame only had 16 bits: 8 bits for the address and 8 bits for the command. This meant that you could send many commands that were very limited. Also, there was no

way to stop commands from being sent at the same time. Because of this, many different companies tried to make it better by adding features that didn’t work well with each other.

With the help of DALI-2, this problem got fixed.

- DALI-2 is much more complete and has many more features than its predecessor. This means that specific manufacturers can no longer make changes to DALI.
- The Digital Illumination Interface Alliance (DiiA) owns the DALI-2 logo and has established strict rules about how it can be used. One of the most important is that for a device to have the DALI-2 logo. It must first be certified as meeting all the IEC62386 standards.

Even though DALI-2 lets you use DALI and DALI components together, you can’t do everything you want to do with DALI-2. This lets DALI LED drivers, the most common type, work in a DALI-2 system.

What is 0-10V dimming?

0-10V dimming is a way to change the brightness of an electric light source by using a range of direct current (DC) voltage from 0 to 10 volts. 0-10V dimming is the easiest way to control the brightness of lights. It allows for smooth operation and dimming to 10%, 1%, or even 0.1% of full brightness. At 10 volts, the light is as bright as it can get. The lights go to their lowest setting when the voltage drops to zero.

Sometimes, you may need a switch to turn them off completely. This simple lighting management system works with your LED lights. Thus, giving you different lighting options and setting the mood. A 0-10V dimmer is a reliable way to make lighting that you can change to fit any mood or task. Or you can create an elegant atmosphere in places like bar and restaurant seating.

How does DALI compare with 1-10V?

DALI was made for the lighting business, like 1-10V. Various vendors sell parts for controlling lighting. Such as LED drivers and sensors with DALI and 1-10V interfaces. But that’s pretty much where the similarities end.

The main ways that DALI and 1-10V are different from each other are:

- You can tell the DALI system what to do. Grouping, setting scenes, and dynamic control become possible like changing which sensors and switches control which lights fixtures when the office’s layout changes.

- Unlike its predecessor, an analog system, DALI is a digital system. This means that DALI can dim lights consistently and let you control them more precisely.

- Because DALI is a standard, things like the dimming curve are also standardized. So devices made by different companies can work together. Because the 1-10V dimming curve isn’t standardized. So using drivers from different manufacturers on the same dimming channel could lead to unexpected results.

- One problem with 1-10V is that it can only control basic on/off and dimming functions. DALI can control and change colors, test emergency lighting and give feedback. It can also make complicated scenes, and do much more.

What are the primary differences between DT6 and DT8?

- DT8 commands and features are only for managing colors, but you can use DT6 functions with any LED driver.

- You can use Part 207, Part 209, or both for a color-changing LED driver. In both cases, Parts 101 and 102 are also implemented.

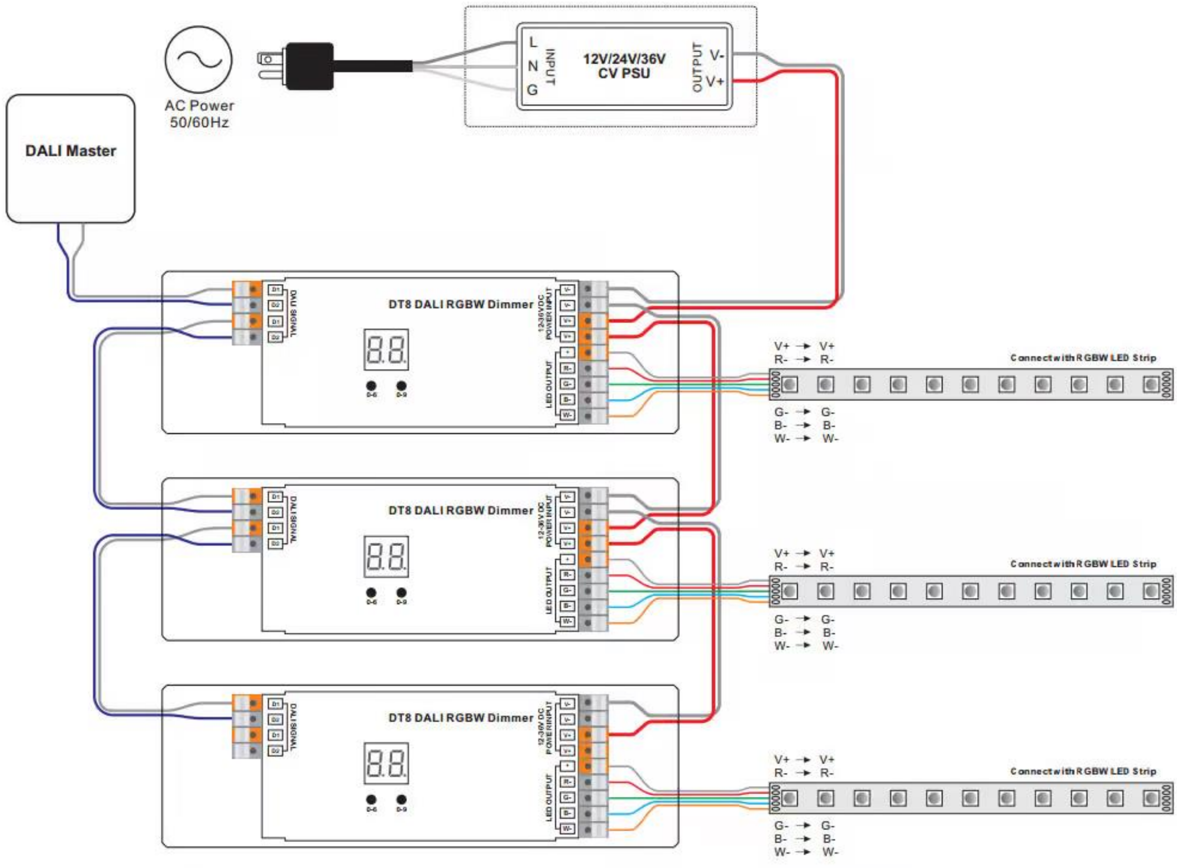
- A single DALI short address is all that is required for a DT6 LED driver to adjust the brightness of a string of LEDs in accordance with a typical dimming curve.

- One DALI short address can control the outputs of any number of DT8 LED drivers. This lets a single channel control both the color temperature and brightness of the light.

- By using DT8, you can reduce the number of drivers needed for an application, the length of the installation's wiring, and the number of DALI addresses. This makes design and commissioning easier.

The most commonly-used DT numbers are:

DT1	Self-contained emergency control gear	Part 202
DT6	LED drivers	Part 207
DT8	Colour control gear	Part 209



DT8 Wiring Diagram

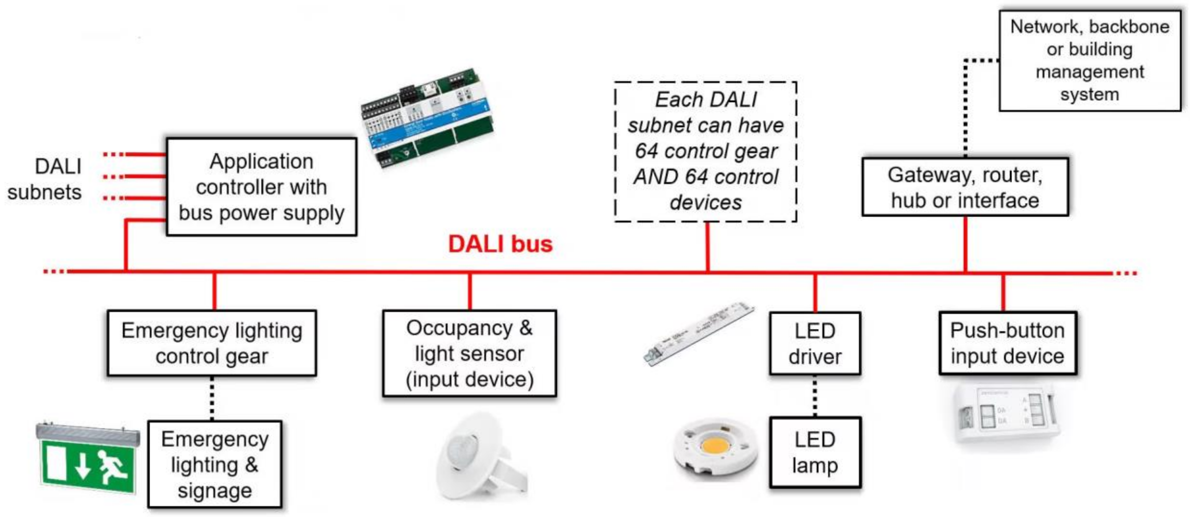
How does DALI compare with KNX, LON, and BACnet?

Protocols like KNX, LON, and BACnet control and track the different systems and appliances in a building. Since you can’t connect these protocols to any LED drivers, they can’t be used to control lights.

But DALI and DALI-2 were made with lighting control in mind from the start. Their command sets include many commands that are only used for lighting. Dimming, changing colors, setting up scenes, doing an emergency test and getting feedback, and lighting based on the time of day are all part of these functions and controls. A wide range of lighting control parts, especially LED drivers, can connect directly to DALI.

Building management systems (BMSs) often use KNX, LON, BACnet, and other similar protocols. They use it to control the whole building. That also includes the HVAC, security, entry systems, and lifts. DALI, on the other hand, is used to control only the lights. A gateway connects the building management system (BMS) and the lighting system (LSS) when needed. This lets the SPS turn on the DALI lights in the hallways in response to a security alert.

How are DALI lighting systems wired?



DALI lighting solutions use a master-slave architecture. So that the controller can be the information hub and the luminaires can be the slave devices. The slave components respond to requests from the control for information. Or the slave component carries out tasks that have been planned, such as ensuring the unit works.

You can send the digital signals over a control wire or bus with two wires. Even though cables can be either positively or negatively polarized. It is common for control devices to be able to work with either. You can wire DALI systems with standard five-wire cabling, so special shielding is unnecessary.

Since a DALI system doesn’t need wiring groups, you can connect all wires parallel to the bus. This is a significant change from traditional lighting systems. Because the commands sent from the control include all the information needed to turn on the lights, there is no need for mechanical relays. Because of this, the wiring for DALI lighting systems is simple, which gives them more flexibility.

Once you complete the wiring, the software on the controller can be set to work with the system. Because the system is flexible, you can build and use different lighting situations and programs without changing the physical wiring. All the light’s settings are very flexible, so you can change the curves and ranges of how bright it gets.

Where are DALI lighting systems used?

DALI is a lighting technology that you can change and is cheap. Most of the time, you can find these types of centralized lighting systems in big commercial spaces. DALI is mainly used in businesses and institutions. But people are starting to use it more often in their homes as they look for better ways to control their lights.

Even though you can add a DALI system to a building that is already up. DALI works best when designed and built from the ground up. This is because when you put in place a brand-new DALI system, there is no need for separate lighting control circuits. Retrofitting an old system but makes it impossible to install the simpler and more efficient DALI wiring system because the control circuits are already in place.

DALI dimming vs. dimming of other kinds

- **Phase Dimming**

Phase dimming is the easiest and most basic way to lower the brightness of a light, but it is also the least effective. Here, the control is done by changing the shape of the sine wave of the alternating current. This makes the light less bright. This method doesn't need dimmer switches or other fancy dimming cables. But this setup doesn't work well with modern LEDs, so we need to find better alternatives. Even if you use LED phase dimming bulbs, you can't notice a drop in light intensity below 30%.

- **DALI Dimming**

You must use a control cable with two cores when putting in a DALI dimmer. Even after the initial installation, these control systems can digitally rearrange the lighting circuits within limits already set. The precise lighting control that DALI lighting offers will help LED downlights, LED accent lights, and LED linear systems. Also, these systems have the most comprehensive range of dimming of any currently on the market. With new improvements, the latest versions of DALI can now control both RGBW and Tunable White lights. Using DALI dimming ballasts for tasks that only need a change in color is a very efficient way to do things.

- **DMX**

DMX is more expensive than other ways to control lights, and installing it requires a special control cable. The APIs of the system allows for precise addressing and can be used in advanced ways to change colors. Most of the time, DMX is used for things like home theater lighting and lighting for pools. DMX is used in a lot of professional systems these days. But, the high cost of setting up makes other options look better.

Dim to dark in the DALI system

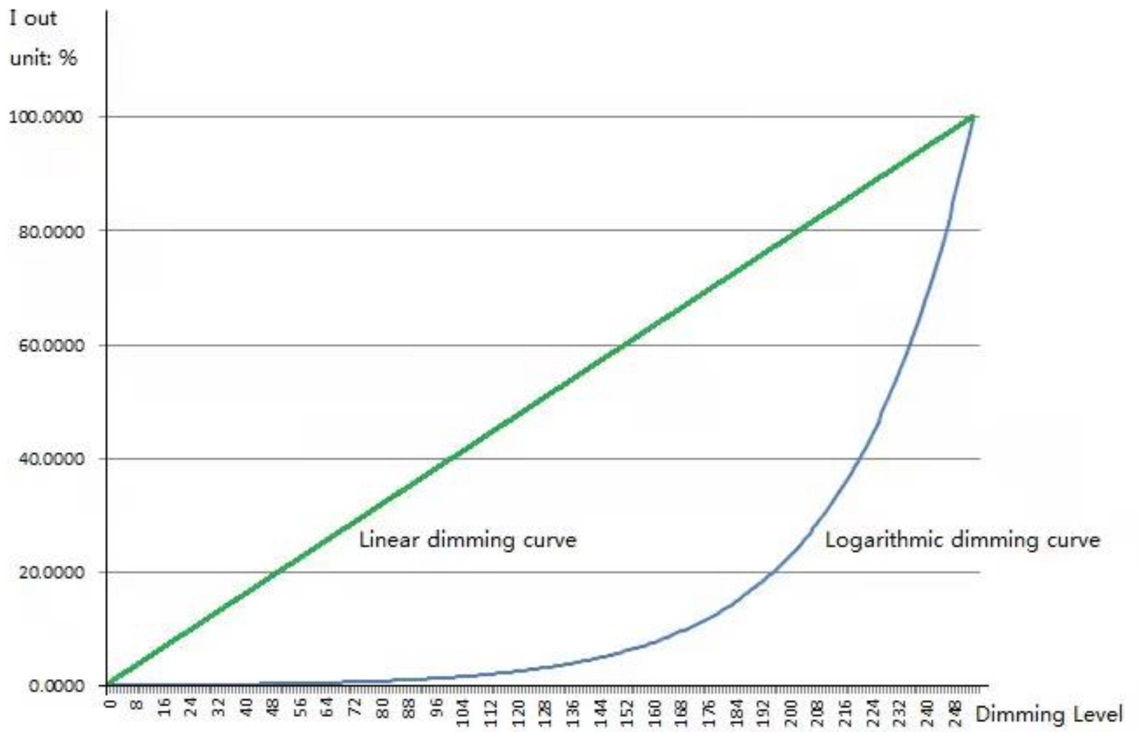
With good quality LED drivers and DALI, you can reduce the light intensity by no more than 0.1%. Some of the older, less complicated ways to dim LED lights, like the phase dimming method, may not be as efficient. This part of DALI dimming is essential because it shows how well these systems can work with how people see.

Because of how our eyes work, the controls for dimming the light should be adjustable down to at least 1%. Our eyes still see a 10% dimming as a 32% b

rightness level, so the ability of DALI systems to go from dim to dark is a big deal.

DALI dimming curve

Because the human eye is not sensitive to a straight line, logarithmic dimming curves are perfect for DALI lighting systems. Even though the change in light intensity looks smooth because there isn’t a linear dimming pattern t.



What is a DALI receiver?

When used with a DALI controller and a transformer with the proper rating, the DALI dimming receivers give you complete control over your LED tape.

You can get a single-channel, two-channel, or three-channel dimmer. Depending on how many separate zones you need to control. (The number of channels a receiver has will tell you how many zones it can work in.)

Each channel requires five amps. The power supply can accept 100-240 VAC and put out 12V or 24V DC.

Advantages of DALI dimming

- DALI is an open standard that ensures devices from different manufacturers always work the same way when connected. You can also switch out your current parts for newer, better ones whenever they become available.

- Easy to put together With DALI five-wire technology, you don't have to divide your lights into zones or keep track of each control line. There are two wires connected to this system. These wires are where the electricity enters and leaves the system.

- The main control board A single lighting control system can be used simultaneously in two or more places. Large commercial buildings can have their lighting scenes set up to meet peak demand, so they can hold many events at once and use less energy.

- Tracking and reporting that you can count on Because DALI works both ways. You can always get the most up-to-date information about the circuit's parts. Each light's status and energy use can be kept track of.

- Controls for the lights that can be set up front Like most other modern technology. You can change the lighting in your room to meet your exact needs. For example, you can change how much natural light comes into your room by changing how bright your daylight bulbs are.

- You can make changes to the setup quickly. After a while, you might want to change up your lights and get something fancier. There's no need to take anything apart or rip the ceiling from under the bed. There is software that can do the programming.

Disadvantages of DALI dimming

- One of the main problems with DALI dimming is that the cost of controls is high at first. Especially for new installations. But in the long run, you won't have to worry about the high costs of maintenance t

hat come with other types of lighting.

- Keeping up with maintenance For the DALI system to work, you must make a database that links LED addresses to the right controllers. For these systems to perform at their best, you must build and keep them in good shape.

- Set up on your own It might seem like DALI is an easy concept to understand in theory. But you can never set it up on your own. Since the design, installation, and programming are more complex, So, you will need an expert installer.

How long has DALI been around?

The history of DALI is fascinating. The original idea for this came from European ballast makers. The first ballast company worked with three others to propose getting the International Electrotechnical Commission (IEC) to make a standard for how ballasts talk to each other. In the middle of it all, in the late 1990s, the United States also got involved.

Pekka Hakkarainen, director of technology and business development at Lutron Electronics in Coopersburg, PA, and chair of the Lighting Controls Council at the National Electrical Manufacturers Association in Rosslyn, VA, says that the standard is part of the IEC standard for fluorescent ballasts and is one of the standard' s annexes (NEMA). A set of rules for communicating with ballast that is generally accepted are given.

In the late 1990s, the first DALI LED drivers and ballasts came out in the United States. By 2002, DALI had become a standard around the world.

Everything You Need to Know About DMX512 Control

It takes skill to light a stage properly. When shapes and colors are put together correctly and flow together in a set, it creates a sensory experienc

e that makes everything else on stage stand out. For this to happen, there needs to be a lot of coordination. During performances, there may be dozens or even hundreds of light sources. Making sure they all work together smoothly requires knowing how to connect many different kinds of electronics. DMX-512 is not a big secret in the lighting business.

The DMX-512 protocol can be used by almost all commercially available automated light fixtures to talk to each other. With different controllers, you can control a wide range of lights with this digital "language."

More Ethernet-based standards make it possible to send DMX-512 data between devices and networking infrastructure (Art-Net and sACN). Manufacturers of lighting control systems use DMX-512 a lot, so anyone who works with modern automated light fixtures needs to know how they can use DMX-512 in both fixtures and consoles.

What is DMX512?

DMX512 is a system for controlling lights but it can also control other things. "Digital Multiplex" tells you how it works from the name itself. Like a time slot, the packets that make up most of a protocol tell which devices should get data. In other words, there is no address and no information about it. In this case, the address is determined by where the packet is.

In reality, the process is straightforward. You can make electrical connections with 5-pin XLR connectors, and the interface in a balanced line pair (with 0 V reference). You can send the bytes and bits to a serial port of 250,000 bps. The RS-485 standard is a type of electrical interface.

It's important to note that "512" in "DMX512" is also very memorable. This number shows that a packet can contain up to 512 bytes of data (513 are sent, but the first is not used). One package can hold all of the information in a DMX universe.

If each light fixture only supports basic dimming for a single color, like white light, then a single data byte can control a light fixture and offer up to 255 levels of brightness, from off (zero) to fully on (255), this means that you can control 512 devices.

A typical RGB control scheme for red, green, and blue light fixtures needs three data bytes. In other words, you can only control 170 RGB devices because a packet (and, by extension, the DMX universe) can hold only 512 usable data bytes.

History of DMX

Before DMX 512, stage lighting manufacturers used a wide range of proprietary and incompatible wire types, which caused a lot of confusion and extra wiring. Then the DMX 512 standard was created.

The United States Institute of Theater Technology (USITT) made DMX 512 in 1986, and USITT DMX 512/1990 came out in 1990.

Modern DMX512, on the other hand, was made by the Entertainment Services and Technology Association (ESTA). In 1998, ESTA started to send DMX512 to the American National Standards Institute (ANSI). ESTA made changes to the last version of DMX512 in 2008.

Basics of DMX control

You can look up “Digital Multiplex Signal” using the letters “DMX.” Because it can work with 512 channels, it is often called DMX 512. An RGB light has three different “channels” or colors. If you think about an RGB light, you may be able to understand better what a “channel” is. One DMX world can control up to 512 monochrome or 170 RGB lights. Using a DMX Decoder/Driver, each fixture receives a unique 512-universe DMX address, and then set up your lighting scenarios to work with those addresses.

What is a DMX address?

A channel is another name for a DMX address. If you want to run several fixtures separately, you’ll need to give each one a unique starting address that isn’t part of any other fixture’s channel group.

• The address, also called the starting address, tells you which channel the light is now tuned to.

• A fixture’s settings are controlled by a DMX personality, which is a channel or group of channels.

Some DMX fixtures have a dip switch that lets you change the default factory address.

What is a universe?

In a DMX world, there are 512 console output channels. When you’ve seen all 512 possible worlds, you can move on to the next one and start over from the beginning.

Depending on the console, “1.214” or “a.214” can be used to describe where a light is in the first universe. Some consoles number the second universe from 513 to 1024.

On the back of your lighting console, you may see labels with words like “Universe 1,” “Universe 2,” “DMX A,” and “DMX B,” The signal from the DMX universe leaves through these connectors.

Each world needs its own DMX cable, and they can’t be put together. Don’t expect lights to care about the existence of universes or even know what they are.

To a light, all worlds look “the same,” and all it needs to feel at home in any of them is a DMX signal. If you don’t connect your light bulbs to the right world, they won’t work the way you want them to.

What are the limitations of DMX 512?

Except for a few minor problems, DMX is a great way to control our lighting. A single DMX wire line can connect up to 32 devices at most.

As the DMX signal goes through your lamps, it gets weaker and weaker. In time, you won’t be able to count on it. The standard says that 32 lights are the ideal number. Depending on many things, that number can be just below 32 or much higher than that. To be safe, don’t use more than 16 lights. If you need to fix a network problem that requires you to climb a ladder or use a lift to get to a high ceiling, keep your group small and be very careful.

Even though DMX signals can travel up to 1800 feet, anything more than 500 feet is annoying. The DMX signals may become unstable depending on how many lights are linked. If your signal starts to go bad, you can quickly fix it by splitting it and making it stronger.

What is DMX splitting and boosting?

You can buy a DMX splitter, also called a DMX Opto-split or DMX repeater. If you have more lights than a single daisy chain can handle but haven’t yet filled your universe.

Each of the splitter’s outputs can send data to up to 32 devices, giving you more options. This is the only way to split your DMX feed into more than one line.

If you try to extend your DMX signal with a passive split (a y-cable), you will have problems.

It’s a passive split, so using both the 3-pin and 5-pin connections on the output side of a fixture that has both will cause problems. Use a 3-pin cable to enter the fixture and a 5-pin cable to leave it to reduce the number of adapters you need.

It’s also important to keep in mind that you might sometimes run into hardware that doesn’t work with other pieces.

Some cheaper fixtures can go into an automated mode when they lose data. These cheap fixtures send out information that isn’t always correct to other fixtures. This shouldn’t happen right in the middle of your show.

A DMX splitter can put each light on its line, keeping it from being affected by other lights. You should always have one of these with you because you never know when you might need it.



DMX splitter

What is RS-485?

The RS-485 standard is a way to connect electronic devices. One of its three wires is a ground or 0V reference, and the other two are used to send signals in a balanced way. On this wire bus, there is room for more than one device, but DMX lighting systems only use a master and a slave.

Because lighting could be made up of more than one part, each lighting unit could have two RS-485 connections. One connection from the controller to another lighting device in the daisy chain acts as an RS-485 slave, and the other connection acts as an RS-485 master.

For now, only one master device and one slave device will be looked at (typically a lighting controller device).

A and B are sometimes called Non-inverting and Inverting, or just "+" and "-" (but don't mix them up with the DC power supply connectors if you call them that!). These two wires send signals out of phase and make up a balanced signal. When one signal wire is at a high voltage compared to the 0V

reference wire, the second signal wire will be at a low voltage, and vice versa.

Serial Communication

Through serial communications, a byte of Data is sent as a string of eight bits, with a start bit and a stop bit in between. The first bit is always 0, which means that a period of one bit has just begun. When using DMX, the two bits that are set to logic 1 are called “stop bits.”

Counting the first bit, the eight bytes, and the two ones at the end, there are a total of eleven bits. What you need to call it is a frame. Each bit is 4us long because the frame is sent 250,000 times per second (sometimes referred to as 250,000 baud).

Details of DMX protocol

The DMX protocol sends a start-of-packet action and a set of frames over a serial bus. The expected behavior is to start the packet, send 513 frames, and then wait (idle) for a while before starting the process again. Keep in mind that not all DMX controllers can send 513 frames as a matter of course.

DMX Channels

At its most basic level, DMX-512 is a group of sets of data called “channels.” “Universe” is sometimes used to describe all of these channels. All of the channels in a “Universe” add up to 512. Each channel has traditionally been a different star in the galaxy. But in modern lighting systems with more complex fixtures, each DMX channel is often connected to another part of an automated lighting fixture.

Each channel can have a value between 0 and 255. First of all, DMX-512 was made to control only the most basic dimmers, so the 0-255 values of each channel were used to manage the light’s output from 0-255. In this way, a user could change how bright a number of dramatic effect lights were. DMX channels are now used to control things like brightness, pan, and tilt on automated light fixtures and other entertainment devices.

One DMX universe can be thought of as a group of 512 channels. Each DMX universe can have one of 256 possible values (255 Plus 1 for 0).

Controlling lighting using channels

Each type of automated lighting fixture needs to have a particular section of the DMX universe set aside for it. With this range of channels, you can change every part of the lamp (often between 12 and 30 channels). The brightness is controlled by channel one of a DMX system, while pan and tilt are controlled by channels two and three, respectively.

Each light has its own DMX start address, which tells us which channel in the DMX universe it will start getting commands from. The fixture’s internal menu is often used to change the DMX start address.

The user must first “patch” the lighting console to give each fixture a unique DMX address. Now that the console and the lights can talk to each other, all kinds of magic can happen. The console coder can choose a light, change some of its settings, and save the changes.

Even though the console’s output often shows explicit information in human-readable values for things like color, intensity, position, and more, these numbers always translate back to a set of DMX channels and their corresponding values.

DMX-512 is needed to communicate with lights because it sends important control data. Until a replacement for the DMX-512 protocol is made, it is essential for everyone who works in lighting to know how DMX-512 is used in the industry.

Hardware Layer

Because the lighting booth is far from the stage, DMX512 is often used over long distances. When there is electromagnetic noise around, a signal goes farther if it can be picked up from farther away. This, along with the fact that DMX is often used in places with a lot of electrical noise. This is the reason why RS-485 was chosen as the best protocol for it.

To figure out what these signals mean, you need to be able to tell the difference between the data wire (D+) and the opposite data wire (D-) (D-). We

call this a “differential signal” because we are measuring the differenc e. So that the difference between the two signals stays the same.

Differential signals like RS485 tend to pick up noise about the same amount on both signal lines. By being able to tell the difference between the two signals, long-distance communication is accessible. The DMX standard says t hat the longest run should be no more than 1,000 feet, but RS-485 is rated for 4,000 feet.

Even though most DMX data is sent over XLR-5 cables, DMX-enabled XLR-3 cabl es are also used. For RS-485, you only need three lines: ground, Data+, and Data-. Those three lines were often all that was used. To prepare for possi ble future growth, an extra pair of data lines had to be added, so the XLR-5 cable was made.

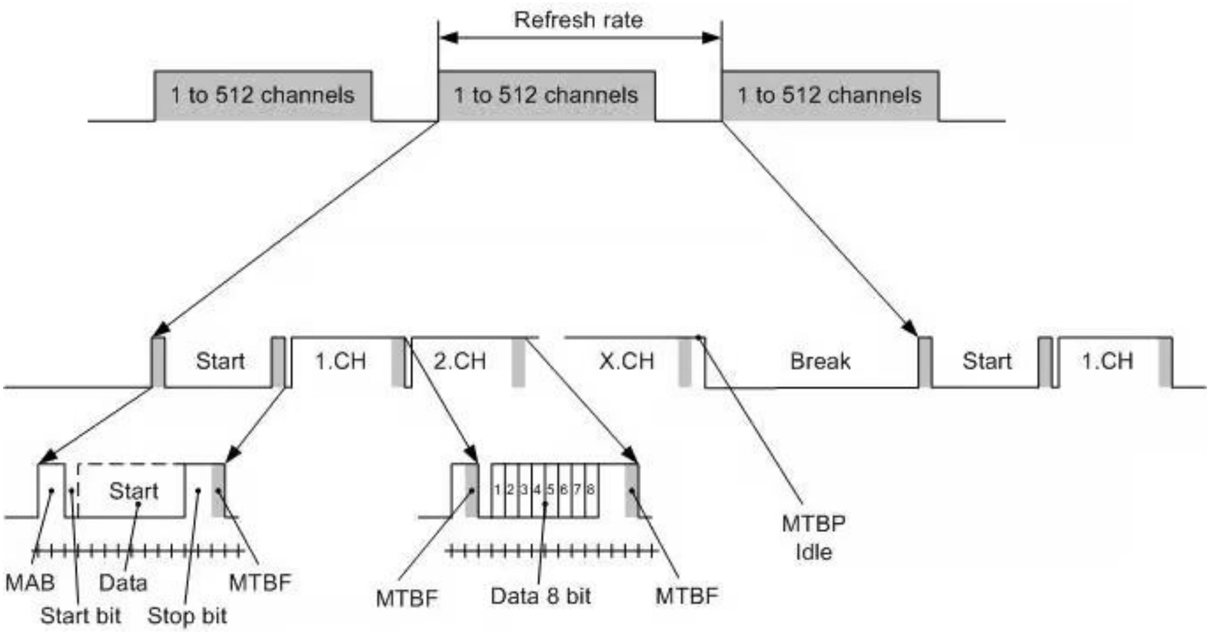
Packet structure

Asynchronous serial data without parity and two stop bits is sent as DMX da ta at 250 kbit/s. So, one bit or tick of the clock takes four seconds to se nd. The packet structure is good, and it starts with a long BREAK during wh ich only noisy Data is sent.

The next peak is called a Mark After Break, which only lasts a short time (MAB). The next thing is the Start Code (SC), which is sent as an 11-bit se rial frame with the value 0x00 as the data. There is one low bit, one byte of data with eight bits, and two high bits. More information in the Start C ode could also show what kind of DMX data is in the packet.

The Start Code 0x17 indicates a text packet, while the Start Code 0xCC indi cates a Remote Device Management packet. After Start Code, the rest of the DMX data is sent in 512 frames that are all the same. These frames are call ed SLOTs (RGB values, CMY values, servo position, fog machine pressure, et c…).

A Mark Time Between Frames (MTBF) that can last up to a full second is show n between each frame. After the data frames comes another MTBP that can las t up to a second. But they are rarely used to keep the frame rate steady.



DMX timing

Data Decoding

How does a device know which packet slot to tune into? You can use A DIP switch to choose the first data slot for DMX fixtures.

After that, the fixture will listen for the number of data slots chosen. For example, if we select slot 12 as the starting point, the simple RGB dimmer will take up slots 12, 13, and 14 and be tuned to the information on those channels. DMX fixtures should add one to their slot counter on the second stop bit, this tells the microprocessor which slot the data goes in when the next frame starts.

So, you can reset the counter whenever you find a separation and mark. You can reset at different times, so a DMX packet doesn't have to fill all 512 slots. But the number of spaces needed by each fixture limits how many fixtures you can install in a single Universe.

Remote Device Management (RDM)

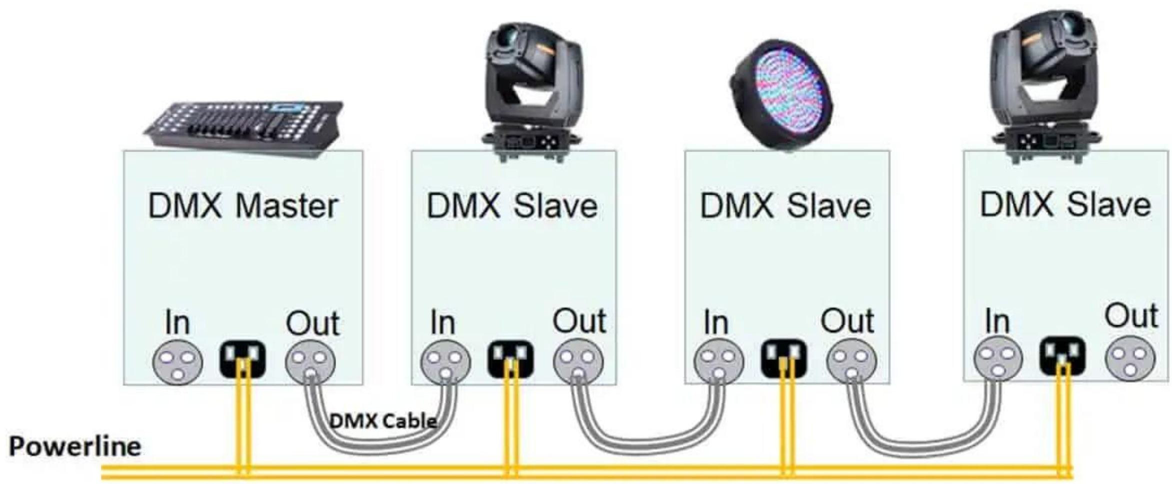
A remote device management method (RDM) that uses the DMX protocol should be utilized to find information about light fixtures. The RDM start code (0xCC) and the ID of the fixture with which the protocol wants to talk are sent in a DMX512 packet.

Before letting the data lines go, the controller will wait for a response. If the controller fails, it might try again after a certain amount of time or give up and move on. RDM is a great way to find out what each fixture can do when you are just getting started in a mysterious Universe.

What is the network topology of DMX 512?

A DMX512 network is set up like a daisy chain, with a multi-drop bus connecting several nodes. In a DMX512 network, there will be one master controller and anywhere from 0 to many slave devices. A lighting console that controls a network of dimmers, fog machines, moving heads, and other devices that can work with DMX is an example of a master and slave device.

Each slave device has one DMX input and one DMX output or throughput connector. The controller' s input is connected to the first slave with a DMX512 cable, and the first slave' s output is connected to the next slave in the daisy chain with another cable.



dmx512 network topology

DMX physical layer - Connectors and wire

8-bit binary data is used to send digital data over a shielded twisted pair-wiring network. Between 0 and 255, the 8-bit information can store 256 different values. In binary, the numbers range from 00000000 (zero) to 11111111 (one million) (255).

The EIA-485-A standard and DMX512 are almost identical, but DMX512 makes minor changes to the EIA-485-A standard. Binary data can be sent by following the EIA-485 standard for voltage levels.

In a DMX512 system, a bus can be up to 1200 meters long but can only connect 32 nodes (3900 ft). When a DMX network has more than 32 nodes, DMX splitters are needed to keep the network from getting too big.

The original DMX512 standard called for the use of five-pin XLR electrical connectors (XLR-5) with female connectors for sending and male connectors for receiving. Instead of the original DMX512 connectors, the eight-pin modular (8P8C, also called "RJ-45") connectors can be used in fixed systems where Equipment doesn't need to be plugged in and out often.

Other form-factor connectors are allowed in places where neither XLR nor RJ-45 will work. But this is only for areas where they will be installed permanently.



XLR 5

How to avoid DMX pitfalls?

A daisy-chained data network with a bus architecture is doomed to fail if there is no way to find and fix errors. Most problems with installation can be traced back to cables that are too short or too bad, or to electromagnetic interference (interference and static discharges).

Here is a list for further information.

1. Get a DMX512 test unit. This is a must if you want to find and fix mistakes.

2. Using the right cables is essential. With DMX512, it is not a good idea to use balanced microphone line wiring.

3. check each cable to make sure it is in good shape before you put it in.

4. Support reverse-phase five-pin XLR to three-pin XLR adapter cables when working with three-pin DMX512 receivers.

5. Make sure you have set up the earth pins on the receiver. Make sure there is no break in the connection between PIN 1 and the chassis by using a continuity tester or multimeter. Put a DMX isolator between the unit and the rest of the chain to keep the chain going. The only thing the chassis should connect to is the output ground of the console.

6. Use good bridges, as number six says. Any connection that isn't secure could be broken.

7. Separate the DMX connections. You'll need a termination plug if your final unit doesn't have a termination function.

8. Find out how much DMX traffic you'll be getting and, if necessary, use line drivers or splitters. The easiest way to keep your DMX512 runs organized is to use a splitter. You should also connect each equipment brand to a separate leg of the splitter that ends in a terminator.

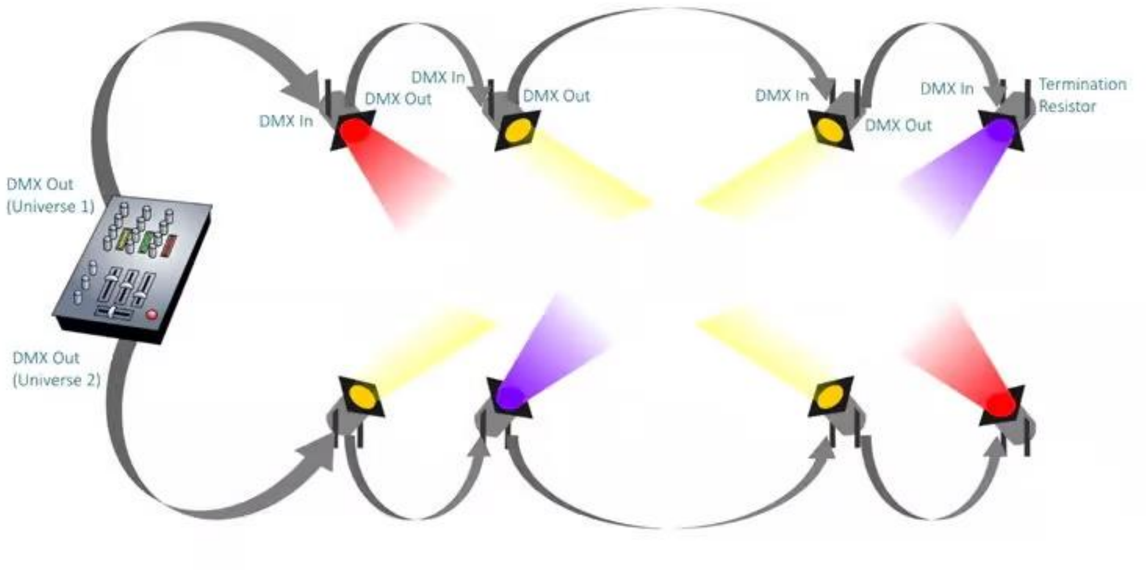
9: Think about how your address is set up right now. It's important to remember that some lights have DIP switches that are set up differently than most.

10. Don't run DMX cables next to power and dimmer load cables.

11. Make sure you read a product’ s directions before using it. No one has ever been hurt because they read a manual.

What is daisy chaining?

Because DMX lights can be linked together in a chain, one DMX channel can control up to 32 lights. So, the output of one fixture can be connected to another fixture’ s input up to 32 times! So, you can control many more lights without using a giant controller (or having a crazy cabling situation). Keep in mind that troubleshooting a chain of 32 lights may be complicated. It can be challenging, especially during a live performance, then troubleshooting a chain with fewer lights.



daisy chaining

Troubleshooting common DMX problems

When using DMX in harsh outdoor environments, it is not unusual to have to fix problems with DMX control.

Here’ s what to do to fix it:

1. Is the DMX turned off? Even though many people think you don’ t need a termination resistor. Making even a small change to the DMX network, like adding a cable, can cause the system to break down or cause r

andom effects. Effects like the dimmers flickering or the lights jerking when they’ re supposed to be smooth and steady.

2. What’ s the state of the wires? Termination may make it easier to get rid of these effects. If only one piece of a data pair is broken, DMX might still work in some way. If a light fixture’ s controller is broken, you can use a jumper cable to connect it directly to the DMX line. If it works now, the wiring is the problem.

3. Do things work as they should? Many things can damage DMX receivers, but lightning strikes happen often. If the device is directly connected to a reliable DMX source through a reliable cable but doesn’ t respond to DMX, it may need service.

4. How well does the hardware support DMX? Can it go at top speed? According to the DMX512 standard, the timing of the DMX signal’ s properties can be set in a wide range. Not every device can handle the full range of times. To fix this, you can change the speed of your ETC product’ s output to work with slower Equipment. The current lineup of ETC products works with the DMX output speeds Max (default), Fast, Medium, and Slow. If your DMX device keeps acting wrong even when it is directly connected to a reliable DMX output, try slowing down the speed of the DMX output to see if the problem goes away. See the [DMX Speed] article for more information about DMX speeds.

What are the pros and cons of DMX512?

A DMX setup could be helpful in many situations. It could make a big difference in your light show’ s appearance, but it also has a few restrictions.

One of the problems with DMX is that it needs more wiring. More wiring takes more time to set up. It takes more time to plan unique light shows ahead of time. It also takes more time to adjust the lights during the event, which could be a problem. You might need more people to run the lighting systems, so keep that in mind when making a budget.

There’ s a chance that the sound-to-light sequences that come with the device. The sound-to-light arrangements may look better than anything you could

program yourself. DMX can’t be used to control lights that aren’t as good.

One of the many benefits of DMX is that it works with a wide range of fixture types and brands, so you can program them all to do the same thing. You can swap out the default, often poorly made. Patterns that come with some light fixtures for your own to make the room look better and use the lights in more creative ways. Moving heads or scanners can make spotlights that can be pointed in particular ways.

To make it easier to control the lights, they go with the music when a song with a slower beat starts, and most programs that came with the computer freeze, the ability to match the mood of a song or performance to a light show. Turning on the strobing at the song’s beginning is an excellent way to improve the show for the crowd.

Art-Net

Art-Net is a free communication protocol. The Artnet sends the DMX512-A lighting control protocol and the Remote Device Management (RDM) protocol over the Internet using UDP.

[1] It lets “servers” and “nodes” (such as smart light bulbs) talk to each other.

The Art-Net protocol is a simple implementation of the DMX512-A protocol over UDP and is used on a private local area network like Ethernet. It is used to send data for controlling lights over the network. Nodes can “subscribe” to “publisher” nodes, so nodes A and B can subscribe to node C, for example. Other management features include finding nodes, updating node control parameters, and sending timecodes. It is also possible to send and receive information about lights (C will unicast information to A and B).

KNX system info in dmx512 control

KNX is an open standard that makes it easier for different home automation systems to talk to each other and work together.

- KNX lets you control various automated innovative features, appliances, and activities. In your home or business, quickly and reliably.
- KNX systems are flexible and can be used in many types buildings. You can use it for single-family homes, large apartment complexes, and offices.
- Lighting design and function controls are essential for making a facility run more efficiently. It saves money on energy costs and protects the environment.
- Because KNX lighting systems are flexible and have a lot of potential, they can help save a lot of money. It can save money on energy costs and can also save carbon emissions.
- Changing the volume of the music or the brightness of the lights has the same effect. Neither action changes the atmosphere.
- You can make warm, inviting spaces indoors and attractive light shows outside. You can also make comfortable places to work and live. You can program lights to turn on and off at certain times to make a building or home safer.
- You can control how much energy your lights use from far with a mobile device and automated features.

DMX vs. DALI Lighting Control: Which One to Choose?

Lighting control is an intelligent lighting technology that allows you to adjust the amount, quality and characteristics of light in a specific area. Dimer is a good example of lighting control.

The two main types of dimming controls used in outdoor lighting fixtures are DMX (Digital Multiplexing) and DALI (Digital Addressable Lighting Interface). To save energy, they use automated controls. However, both types of dimming controls are unique and different from each other.

Are you excited to learn more? Let’s start by understanding what these controls mean.

What is DMX?

DMX512 is a system for controlling lights but it can also control other things. “Digital Multiplex” tells you how it works from the name itself. Like a time slot, the packets that make up most of a protocol tell which devices should get data. In other words, there is no address and no information about it. In this case, the address is determined by where the packet is.

In reality, the process is straightforward. You can make electrical connections with 5-pin XLR connectors, and the interface in a balanced line pair (with 0 V reference). You can send the bytes and bits to a serial port of 250,000 bps. The RS-485 standard is a type of electrical interface.

It’s important to note that “512” in “DMX512” is also very memorable. This number shows that a packet can contain up to 512 bytes of data (513 are sent, but the first is not used). One package can hold all of the information in a DMX universe.

If each light fixture only supports basic dimming for a single color, like white light, then a single data byte can control a light fixture and offer up to 255 levels of brightness, from off (zero) to fully on (255), this means that you can control 512 devices.

A typical RGB control scheme for red, green, and blue light fixtures needs three data bytes. In other words, you can only control 170 RGB devices because a packet (and, by extension, the DMX universe) can hold only 512 usable data bytes.

For more detailed information, you can read Everything You Need to Know About DMX512 Control.

What is DALI?

DALI stands for “Digital Addressable Lighting Interface.” It is a digital communication protocol to manage lighting control networks in building automation projects. DALI is a trademarked standard that is used all over the world. It makes connecting LED equipment from many manufacturers easy. This equipment can include dimmable ballasts, receiver and relay modules, power supplies, dimmers/controllers, and more.

DALI was made to improve the 0-10V lighting control system by adding to what Tridonic’s DSI protocol could do. DALI systems let the control system talk to each LED driver and LED ballast/device group in both directions. Meanwhile, 0-10V controls only let you talk to them in one direction.

The DALI protocol gives LED control devices all the commands. DALI protocol also gives communication channels they need to control building lighting. It is also scalable and can be used for simple and complicated installations.

For more detailed information, you can read Everything You Need to Know About DALI Dimming.

Similarities between DMX and DALI

DMX and DALI are similar in some ways, making them useful in different situations.

- **Light controllers**

You need a control panel for all the electricity between each group of light fixtures. These are meant to let DALI users control fading, but DMX uses a controller that sends information back to the central controller. These control panels can be used for many things, like fading and changing colors.

RS422 or RS485 controllers are used for specific interface controls for DMX.

- **Distance of operations**

While DMX and DALI use different kinds of wiring, they work in the same range. Both let you connect the lights to the main controller up to 300 meters

away. This means that the main control board needs to be put in the best place. You shouldn't be able to go more than 300 meters in any direction. This is where the fixtures are linked to the high mast lights. Even modern super domes are about 210 feet in diameter, which makes it possible to put lights in all areas.

- **High mast lights**

With these two controllers, lights on tall mast poles can be turned on and off even though the speed of operation can be affected by differences in wiring. The DALI system will need two light fixtures per control unit for high mast lighting, and DMX will need a different interface controller for each light bank.

- **Off-field lights**

These lights connect to the lights in the stands and other stadium areas. One of these might be a fade control that is turned down just enough so that people can still walk up and down stairs. Turning on the house lights when a team scores a goal can highlight a big win.

Differences between DMX and DALI

There are distinct differences between DMX and DALI, designed to determine whether they are suitable for a given application. Some of these differences are outlined in the table below.

	DMX	DALI
Speed	Fast speed control system due to the	Slow speed control system
Number of connections	Can have a maximum of 512 connections	Can have a maximum of 64 connections
Type of control	Centralized control system	Decentralized control system

Color control	Using the specialized RGB-LED, you can handle color control using DMX	It does not support color change; only fading of the lights
Cable requirement	With the maximum of 300m coverage, it requires a Cat-5 cable requirement which is also attributed to its fast speeds	Still with a maximum of 300m coverage, it uses a two-wire connection setup
Automatic requirement	Cannot perform automatic addressing	Can perform automatic addressing
Dimming control	Easy to use	A bit complex and might require some training before use

Differences between DMX and DALI

- **Color control**

DMX is the only system that lets you change colors. Also, a specific LED bulb that can change colors must be used. The best choice is the RGB-LED, though there might be better options for field lighting. These lights can be pointed at both the audience and the playing area. Since the DALI control system was made to only work as a fader, it can't change the lights.

- **Speed control**

When using the DMX controller, there is a clear difference in how fast things move. The fixture gives you information in real-time through a simple interface. Because of the way the wiring is set up, this information is sent back faster, making it possible to control the lights immediately. The DALI method, which uses two wires, has a delay of up to 2 seconds. A longer delay time doesn't make it harder to control the brightness, but it takes longer to compare the results.

- **Dimming**

The DALI's simple dimming control comprises a single slider and an on/off button. With the DMX, you have the same options for delays, FX, and preprogrammed time fades. The main difference is that DALI has a warning light for

lights that aren't working right, and the DMX doesn't have this function. When it comes to basic dimming control, the DALI controller is easier to use than the DMX controller in many ways.

- Controller

The DALI controller looks like a slide controller. The controller is a black box with a switch that turns it on and off and some sliding controls. The DMX controller panel goes further than that with controls that slide and preset buttons. It also lets you control the lighting to change and adapt the colors. Again, the two main controllers are very different from each other. Different light patterns and FX can be made with the DMX's built-in presets.

- Number of lights

This is the most significant difference between these two. DALI can control 64 lights, but DMX can control up to 512 lights and fixtures individually (1 channel per light). There is a perfect reason for this, though. The DMX lighting system controls different colored lights that can be used to make stunning effects. Now, sporting events often use flashing lights to get people excited. But DALI works best when used with both on-field and off-field lights.

- Warning indicator lights

When a light bank doesn't work, the intelligent design of DALI makes a warning light come on right away. The light either doesn't respond or doesn't work right. Dimming LED lights can be a sign that the light controller has broken. This is a nice built-in feature that hopefully never gets used. The DMX system is set up so that the interface system gets information in real-time, whether or not the lights are responding.

- Wiring differences

The interface wire that the DMX uses is a CAT-5 cable. This is how information is sent to and received from the LED fixture. Also, it ensures that the information about how lights work is quick and easy to understand. You can also change the lighting using the control panel switches. Even though DALI only uses two wires, it takes longer for the signal to get to the main controller.

- **Effect control**

The DMX controller is the clear winner in making effects that stand out. It has extra effects that can turn any game into an LED light show. When you add LEDs that change color, you get a lot of great options for making a high-intensity game. It can also be used with music to make certain parts of a sporting event stand out. It’s a great lighting controller that can make a game feel more prominent.

Applications for DMX and DALI

- **Roads and Highways**

Lighting is an essential part of driving. Good lighting allows drivers and people walking to see well on the road. High mast lights are set up at regular intervals along the network of highways to ensure that the lighting is the same everywhere. DMX lighting control is used on roads and highways because it is easy to use.

- **Sport Fields**

You need different kinds of light for various sports, which means that DALI and DMX are good choices for lighting sports fields. The goal is to ensure that both the audience and the players have a good time and that the lights don’t take away from that.

For example, the DALI controller and high mast poles would work best for a tennis court. This is true because the tennis court is small, making it easier to control each light individually.

The best way to improve the spectator’s experience on the field is to use DMX to control the lights. DMX works quickly, and the effects are impressive because the lights’ color can change instantly, making it enjoyable for the audience.

Both of these light controllers are excellent choices for sports fields. Depending on the lighting needs, some sports fields have switches in different places around the area. Most of the time, the DALI controls are not on the field, but the DMX controls are.

- **Commercial Settings**

In business places like airports, tall mast poles need to have a lot of lights on them. The controls for the light are also critical. Also, everyone at the airport needs enough light, including the pilots. In business settings, both types of light controls are used. Most of the time, DMX is recommended for areas that need constant lighting, while the DALI control system is better for areas that need the light that can be changed.

Factors to Consider When Choosing between DMX and DALI Lighting Systems

- **Installation lead time**

A trained electrician must set up DMX and DALI systems. The main controller must be at most 300 meters from where the wiring is going. This includes adding the fader control, which lets your LED light fade in and out correctly. The CAT-5 wiring interface must be joined with special wire connectors if the DMX system is used. It will take some time to connect all the lights to work correctly.

- **Type of color-changing lights**

LED lights can change colors only with the DMX system, but your stadium must decide which RGB-LED light to use. These lights could be spotlights, floodlights, or a mix of both. Thanks to the DMX system, you can connect up to 170 fixtures (3 channels per RGB bulb), giving you much room to grow. You can make any color you want with these lights by mixing three colors. Because the light temperature (in Kelvin) is unique to sports lights, they can't change it.

- **The amount of wiring involved**

A professional electrician in a stadium will know that wiring often needs twice as much as what is required. Before wiring starts, each light must be checked to ensure it has the proper connection. This is where most of the lead time will be used, more than anything else. This will also take time to set up because the DALI system uses two cables to connect to each fixture.

- **The cost of adding more lights**

When you spend money on sports lighting, you get a long-term plan for getting your money back. LED lighting gives a good return on investment over a long period. If LED lighting is expected to work perfectly for more than 20 years, the costs could be considered high. Still, it costs more to build a sports stadium than it will last. LED sports lights are already 100% cost-effective because they save up to 75% - 85% on energy costs.

IK Rating: The Definitive Guide

https://www.ledyilighting.com/ik-rating-the-definitive-guide/

IP Rating: The Definitive Guide

Durability is an important question when purchasing any electrical device. And the reliability of any product directly or indirectly depends on its IK ratings. So, checking the IK rating is essential whenever you buy any electrical appliance.

IK rating determines a product’s degree of protection against any impact. Any indoor or outdoor enclosure can go through unexpected happenings, like getting hit or falling from a height. And to ensure the device remains damage free after such an incident knowing the IK rating is crucial. It is graded in different levels, and each rating indicates a specific resistance limit.

This article will provide a complete guideline about IK rating, its uses, benefits, and how to determine it. You will further get suggestions about getting the ideal IK ratings for different types of the light fixture. So, without further delay, let’s get into the discussion-

What Is IK Rating?

Impact Protection (IK) rating indicates the degree of protection of an electrical enclosure against any mechanical impact.

The European standard BS EN 50102 first defined IK Ratings in 1995. It was later amended in 1997 with IEC 60068-2-75. After that, in 2002, the European Standard EN62262 was issued as equivalent to the International Standard IEC 62262.

Before the IK rating was standardized, manufacturers used an additional number with the ingress progress (IP rating) to indicate the resistance to impact. This extra number was added in brackets as anti-impact code. For example- IP66(9). But using such nonstandard numbering was very confusing as there wasn' t any official rating system. So, to solve this confusion, the IK rating was issued in 1995.

IK rating is a crucial factor for every electrical enclosure. It indicates how many impacts should be made to a device or what atmospheric condition it can tolerate. It even describes the hammer' s size, dimension, and material used to create impact.

So, in simple words, the IK rating determines the ability of an enclosure to withstand sudden or intense force or shock.

What Do IK Rating Numbers Mean?

Each number used in the IK rating has a particular meaning. The rating is graded from 00 to 10. And these numbers indicate the degree of protection from any external impact. So, the higher the grade, the better impact protection it provides. For example, a LED light with IK08 gives better protection than one with IK05.

IK Rating Chart

With the IK rating, you can determine the resistance level of any electrical enclosure. The protection level of different IK ratings and their impact are as follows-

IK Rating	Protection	Impact
IK00	Not Protected	-

IK01	Protected against 0.14 joules impact	Equivalent to 0.25 kg of mass falling from 56 mm above the impacted surface
IK02	Protected against 0.2 joules impact	Equivalent to 0.25 kg of mass falling from 80 mm above the impacted surface
IK03	Protected against 0.35 joules impact	Equivalent to 0.25 kg of mass falling from 140 mm above the impacted surface
IK04	Protected against 0.5 joules impact	Equivalent to 0.25 kg of mass lowering from 200 mm above the impacted surface
IK05	Protected against 0.7 joules impact	Equivalent to 0.25 kg of mass falling from 280 mm above the impacted surface
IK06	Protected against 1 joules impact	Equivalent to 0.25 kg of mass falling from 400 mm above the impacted surface
IK07	Protected against 2 joules impact	Equivalent to 0.50 kg of mass lowering from 56 mm above the impacted surface
IK08	Protected against 5 joules impact	Equivalent to 1.70 kg of mass falling from 300 mm above the impacted surface
IK09	Protected against 10 joules impact	Equivalent to 5 kg of mass lowering from 200 mm above the impacted surface
IK10	Protected against 20 joules impact	Equivalent to 5 kg of mass falling from 400 mm above the impacted surface

Impact Test Characteristics

IK rating impact test considers the impact energy in joule, the radius of the striking element, the material of the impact, and its mass. The test also includes the height of free fall and three types of striking hammer tests, i.e., the pendulum hammer, spring hammer, and free fall hammer.

IK code	IK00	IK01-IK05	IK06	IK07	IK08	IK09	IK10
Impact Energy (Joules)	*	<1	1	2	5	10	20
Radius of striking element (Rmm)	*	10	10	25	25	50	50
Material	*	Polyamide 1	Polyamide 1	Steel 2	Steel 2	Steel 2	Steel 2
Mass (KG)	*	0.2	0.5	0.5	1.7	5	5
Free Fall Height (M)	*	*	*	0.40	0.30	0.20	0.40
Pendulum hammer	*	Yes	Yes	Yes	Yes	Yes	Yes
Spring hammer	*	Yes	Yes	Yes	No	No	No
Free fall hammer	*	No	No	Yes	Yes	Yes	Yes

From these charts; you can see that IK10 gives the highest level of protection. And it can resist an impact of 5 kg, creating an energy of 20 joules.

Factors For IK Rate Testing

When conducting an IK rating test for any electrical enclosure, you should know some factors. These are mentioned below-

Impact Energy

Thre impact energy for IK testing means the power needed to fracture an enclosure under standard conditions. It is measured in joule (J). For example-a LED neon flex with an IK08 rating can withstand an impact energy of 5 joules. That is, if an object of 1.70 kg of mass falling from 300 mm height strikes the neon flex, it will stay protected.

Material Of The Impact

The impact material is essential in the IK rating test. For testing IK01 to IK06, Polyamide 1 is used as the impact material. And steel is used for testing IK07 to IK10. So, as steel is much more robust than Polyamide 1, the products with IK07 to Ik10 ratings are more protected.

Height Of Fall

In testing the IK rating, the height of fall of the impact varies for different ratings. For example- for IK09 testing, the impact should be set at 0.20 meters to strike the test enclosure. Similarly, for IK10 testing, the free fall height is 0.40 meters. So, the testing enclosure should resist falling from a higher altitude to pass a higher IK rating.

Mass Of The Impact

The mass of impact for testing also varies with the IK rating. For example- to test whether a light fixture is IK07 rated, it should resist the strike of an impact with 0.5kg mass. And thus, the impact mass will increase with the increase of IK ratings.

Type Of Hammer Test

IK rating testing involves three types of hammer testing- spring hammer, pendulum hammer, and free fall hammer. A brief discussion about these types is as follows-

1. Spring Hammer Test

A Spring hammer test is conducted to test the resistance of regular interference. This hammer testing applies for IK01 to IK07 ratings.

2. Pendulum Hammer Test

The pendulum hammer test is more intense than the spring hammer test. It applies to all IK ratings. Even IK10 ratings must pass a pendulum test to ensure better protection against impact.

3. Free Fall Hammer Test

Free fall hammer testing is more robust than the spring and pendulum method. This test applies to higher IK rating tests ranging from IK07 to IK10.

Equivalent to IP Rating

The IK rating of an enclosure must be equivalent to the ingress progress (IP) rating. So, for example- if a light fixture passes IP66 and IK06, it should be labeled as the same. But if the same fixture somehow fulfills IK08 but maintains only IP54, it can't be marked as IP66 and IK08. So, in this case, you should label the fixture as 'IP66 and IK06' or 'IP54 and IK08'. However, check- IP Rating: The Definitive Guide to learn more about IP rating.

So, these are the factors you should consider while taking the IK rating test.

How To Test IK Rating?

IK rating test is carried out in a suitable environment with the 'control dropping' method. Here a certain amount of energy is applied to the enclosure to pass the test. However, there are two main elements in testing IK rating. These are-

- The distance between the sample enclosure and the hammer
- Weight of the hammer

A fixed weight is placed at a fixed height and angle above the enclosure to perform this standardized test. Then the weight is allowed to free fall/strike to create a specific impact energy. This procedure is repeated three times at the same spot. And To ensure solid impact protection, the weight is allowed to strike without bounces at several enclosure locations.

How To Improve IK Rating?

IK rating is an essential fact to consider for any electrical device. So, here are three ways in which you can improve the IK rating-

Material

The material of the enclosure plays a crucial role in passing the IK rating. So, choosing a material with better resistance against impact is essential. Yet, the three best materials for the enclosure are-

- **Stainless Steel:**

Though stainless steel is the most expensive material, it creates the best resistance against impact.

- **Glass Reinforced Polyester:**

Glass-reinforced polyester is another excellent material for an enclosure. It is firm and gives excellent impact resistance. But the drawback of this material is that it is prone to UV radiation and is non-recyclable.

- **Polycarbonate:**

Polycarbonate is the latest technical material to use on enclosures for improving IK ratings. It is a UV-resistant and non-corrosive material. Besides, polycarbonate is also recyclable.

Therefore, choosing these three materials in the enclosure can improve the IK ratings.

Thickness

Increasing the thickness of the enclosure material gives better protection against impact. Thus any electrical device with a thick enclosure can pass a higher IK rating test. Therefore, it will increase the durability of the product.

Shape

The shape of an enclosure can be impact resistant. Design the enclosure so that the impact energy deflects to a broader area. Then, when an object strikes the device, the energy will not get into a specific area; rather, it will spread into the surroundings. And such a shaping will not cause severe damage to the product.

In this case, round enclosures are the best option. Corners are the weakest point, so a round shape deflects the impact energy to a larger area. Thus, it provides better protection than any enclosure with sharp corners.

Thus, following these key points, you can improve the IK rating of electric enclosures.

Where Are IK-Rated Products Used?

Ik-rated products are used where there is a higher risk of external exposur e or damage. The electrical devices that face adverse atmospheric condition s and have a chance of more significant impact have a high IK rating. The p laces where IK-rated products are mainly used are-

- Industrial areas
- High traffic areas
- Public access areas
- Prisons
- Schools, etc.

IK Ratings For LED Lighting

For LED lights, the IK rating indicates whether the internal circuit of the light is dropped or affected by any mechanical impact. It also determines i f the light will still work when going through any damage. In the lighting industry, IK ratings of luminaries are crucial, especially for outdoor ligh ting. That is because outdoor lights face harsh environmental conditions th at can damage the lamps. And so, it is necessary to check whether the prote ction level of the light meets industry or national requirements. That is w hy the IK rating is vital when purchasing flood lights, street lights, stad ium lights, and some special outdoor lights. Here are some suitable IK rati ngs for different types of outdoor lighting-

So, when installing any fixture outdoors, always check the IK ratings. And for better protection, always go for a higher IK rating, especially for ind ustrial lighting.

IK Rating: Hammer Test For LED Lights

The IK rating of lights is rated from IK01 to IK10. And for LED lights, hammer testing to determine the IK rating is divided into two groups. The first group includes IK01 to IK06, which falls under the spring impact hammer test. And IK07 to IK10 comprise the second group that passes through the pendulum test. Details description of these two light hammer tests are as follows-

1st Group: Spring Impact Hammer Test (IK01 to IK06)

Spring impact hammer test of lighting is done to examine whether it can resist regular encounters. This spring hammer has a cone-shaped structure with a spring locking mechanism. When the cone end is pressed, the compressed spring from the other end hits the fixture under test. And repeating this procedure, the spring impact hammer testing of light is conducted.

The spring hammer test is done for rating IP01 to IK06. This group of ratings is suitable for indoor lighting and has relatively small energy (from 0.14J to 1J). So, indoor lighting like- downlight, high bay light, etc., undergoes spring hammer impact test.

2nd Group: Pendulum Test (IK07 to IK10)

The pendulum test is a high-strain test to determine the maximum protection of an electrical enclosure or light fixture. In this test, a fixed weight is attached to a pendulum that strikes the light fixture at a definite height. And this test is done for IK07 to IK10 rating, requiring more significant test energy (ranging from 2J to 20J). The pendulum test is used in the IK rating taste of street lights, stadium lights, explosion-proof lights, etc.

Cautions For Light IK Rating Test

While testing the IK rating of light fixtures, you should keep some facts in mind. These are-

- The test should be carried out at the necessary air pressure and temperature. According to IEC 62262, in testing IK ratings of light, the suggested temperature ranges from 150C to 350C, and the range for air

pressure is 86 kPa-106 kPa.

- When carrying out the testing, apply impact to the entire enclosure. Doing so will ensure proper protection of the light fixture.
- The test must be carried out with the lights completely assembled and installed. Thus, the final product will go through testing and ensure accurate IK ratings.
- There are no pretreatment requirements for testing samples, and the l amp shouldn' t be powered on during the test. If you power the fixtur e while IK testing, there is a possibility of an accident. So, be car eful with electrical contact and unplug the lights while testing.
- If the luminaire' s installation may impact the test results, you sho uld conduct the test at the luminaire' s installation location.
- If the impact test is impossible due to the luminaire' s structure, a unique luminaire can be used to complete the test. Yet, you shouldn' t replace the fixture in a way that reduces its mechanical strength.

How Does the LED Neon Flex Pass the IK08 Test

LED neon flex must undergo a pendulum hammer test to pass the IK08 test. In this IK rating test, the neon flex is fixed, and the pendulum hammer is all owed to hit it. Here, the hammer strikes the neon flex from a distance of 300mm or 0.03m. This procedure is repeated several times at different point s of the flex. And if the LED neon flex remains protected without causing a ny damage to the internal circuit and still works, it passes the test. And so the fixture is rated IK08.

A LED neon flex with an IK08 rating is excellent for indoor and outdoor lig hting. They can work great in harsh environmental conditions. Yet, if you a re looking for the best quality LED neon flex, go for LEDYi. We provide neo n flex with an IK08 rating and protection up to IP68. Thus, our flexes are robust, waterproof, and can resist extreme weather conditions.

Why Is Mentioning IK Rating Important?

IK rating is a crucial feature to consider in purchasing electrical devices like- lights, smartphones, cameras, etc. But why is it so important to mention IK ratings on devices? Here are the reasons-

Ensure Better Quality

Including an IK rating in the specification of any product indicates better quality. Thus, it makes the product more approachable than the competitive brand.

Improve Brand Image

A good brand always provides sufficient information to its customers about the product. And to do so, it is essential to test products from different parameters. Among these tests, the IK rating test is one of the crucial matters to include.IK ratings state that the brand is cautious about its product quality and thus improves its image.

Increase Reliability

IK rating indicates the product’s resistance to any impact. So, a product with an IK rating ensures its protection level. And thus, customers can trust the brand.

Improve Product Lifespan

Any product with higher IK ratings uses quality materials that give better protection against unfavorable environmental conditions. So, the product will not get affected or destroyed when it has a good IK rating. Thus, it improves the lifespan of the product.

Therefore, the IK rating directly or indirectly indicates the uses of any product. For example- any fixture with lower IK ratings is unsuitable for outdoor uses. So, consider the IK rating before purchasing any product.

IP Rating Vs. IK Rating

IP and IK ratings are the two most used terms when determining the quality of any electrical device. They ensure products' resistance level and durability. However, these two terms are entirely different from each other. Their differences are as follows-

IP Rating	IK Rating
IP rating stands for Ingress Progression.	IK rating stands for Impact Protection. Here, 'K' defines 'Kinetic'; it is used to differentiate from IP rating.
It indicates the level of protection of any enclosure from solid and liquid ingress.	The IK rating indicates an enclosure's resistance level against any impact.
The standard EN 60529 (British BS EN 60529:1992, European IEC 60509:1989) defines IP ratings.	The standard BS EN 62262 relates to IK ratings.
The IP rating is graded using a two-digit number. Here, the first digit indicates the protection against solid ingress, and the second digit determines the protection against liquid ingress.	IK rating has one number to indicate the degree of protection and is graded from IK00 to IK10. The higher the IK rating, the better protection it provides against impact.
The factors- dustproof, water resistant, etc. are related to IP rating.	It involves impact energy, hammer test, etc.
For example- a neon flex with an IP68 rating means it is entirely dust and waterproof.	For example- a neon flex with IK08 indicates that it can resist 5 joules of impact.

The Ultimate Guide to LED Neon Flex Lights

Neon flex lights are one of the most popular and versatile lighting options on the market today. They are perfect for everything from creating a cozy atmosphere in your home to brightening up a commercial space. But with so many different types, colors, and styles of LED neon flex lights available, it can be hard to know where to start. This guide will provide you with all the information you need to choose the perfect LED neon flex lights for your needs.

What is Traditional Neon Lights?

Traditional Neon lights are brightly emitting electrified glass tubes or bulbs filled with rare neon gas or other rare gases and are a type of cold cathode gas discharge lamp. A neon tube is a sealed glass tube with electrodes at both ends, filled with low-pressure gas. A voltage of several thousand volts is applied to the electrodes, ionizing the gas in the tube, causing it to emit light. The color of the light depends on the gas in the tube. Neon is a transliteration of neon light, a rare gas that emits a popular orange-red light. But other colors are produced using other gases, such as hydrogen (red), helium (pink), carbon dioxide (white), mercury vapor (blue), etc.

What is LED Neon Flex Lights?

LED Neon Flex Light is a flexible linear uniform light that uses high brightness SMD LED strips as the internal light source and is wrapped with silicone, PVC or PU(Polyurethane) to diffuse the light.

What are the features of LED Neon Flex lights?

1. The working voltage is low because of the LED light source. The power consumption is small and energy-saving. Even in the 24Vdc, it can work well, and its power consumption generally does not exceed 15W per meter.

2. High brightness. The light source is made of ultra-high brightness SMD LEDs, with a density of 120 LEDs per meter, ensuring high brightness and an overall uniform luminous effect.

3. Durable and long life. The light source is made of LEDs, which can last up to 50,000 hours. The flexible silicone/PVC/PU gel is also used, so there is no problem breaking like traditional glass neon light.

4. Flexible, the LED neon flex light can be bent to a minimum diameter of 5 CM and sheared.

5. Safe. Unlike traditional glass neon lights, which require a high voltage of up to 15,000V for regular operation, the LED neon flex light operates at 12V or 24V and is safe to use as it will not break and has low heat dissipation.

6. Simple and easy to transport and install. Because the light source is LED and the casing is PVC/Silicone/PU, it will not break during transportation. You only need to fix the mounting clips first or mounting channels, then press the LED flexible neon into mounting clips or mounting channels.

What is the advantages of LED Neon Flex Lights compare with Traditional Neon Lights?

1. Traditional neon lights are expensive, complex, and inconvenient when using glass tubes, high voltage electricity, and inert gas. LED neon flex lights using LED technology and a new structure, with a PVC, silicone, or PU housing wrapped around the LED light source, using unique optical design technology and a special housing design to increase the intensity and uniformity of the light. The LED neon flex is easy to manufacture and very efficient.

2. LED neon flex lights are brighter than traditional neon lights.

3. LED neon flex lights have a longer life span and are more durable. With LED as the light source and PVC/Silicone/PU housing, the life span of LED neon flex is up to 30,000 hours.

4. LED neon flex lights are more energy-efficient, with a minimum power of less than 5W per meter than traditional glass neon lights, generally more t

han 20W per meter.

5. Traditional neon lights use a transformer to raise the voltage from 220V/100V to 15000V to excite the inert gas in the glass tube. One set of glass tube can only emit one color of light. If multiple colors are required, multiple sets of glass tubes are needed. And the traditional neon shape needs to be designed in advance, and the shape cannot be changed after the factory has produced it. LED neon flex lights can be bent and cut at the site, and there are many different colors to choose from white, tunable white, RGB, RGBW, DMX512 Pixel, etc.

6. LED neon flex lights is safer, as it uses low voltages: 12V, 24V, shockproof, low heat dissipation, and safe to use.

7. Conventional neon lights can only work at normal room temperature, and the voltage must be raised during use, which is also more expensive and has a short service life. The LED neon flex light uses LED as the light source, a cold light source with low heat dissipation and low power consumption. It is also shockproof and heat resistant.

8. LED neon flex lights are more friendly to the environment. While traditional neon lights are polluted with heavy metals, LED neon flex lights do not contain heavy metals or other harmful substances.

What is LED Neon Flex Lights used for?

1. Signage & Exhibit Lighting



2. Building facades



3. Cove lighting



4. Retail displays



5. Architectural lighting



6. Marine Lighting



7. Automobile Lighting



8. Artwork Lighting



9. Special Event Lighting

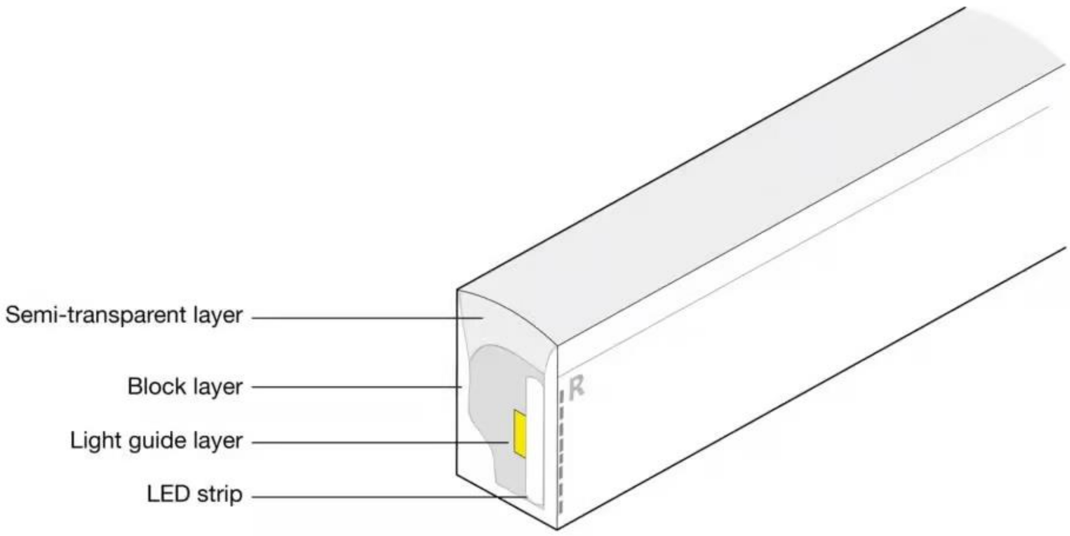


10. Home Lighting



Structure of LED Neon Flex Lights

The LED neon light consists of a flexible LED strip inside and wrapped with PVC, silicone or PU to diffuse the light and make the light uniform.



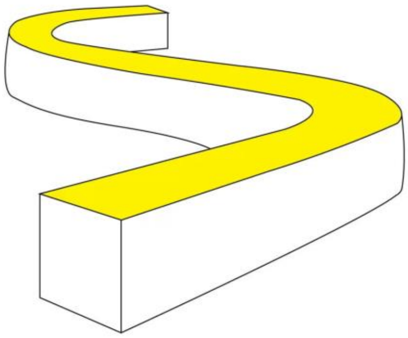
Classification of LED Neon Flex Lights

Bending Direction: Horizontal Bending(Side Bending), Vertical Bending(Top Bending), 3D Bending(Horizontal & Vertical Bending), 360 Degree Round

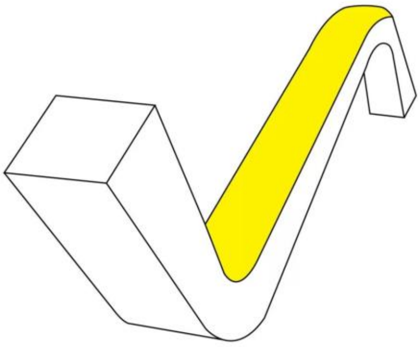
Housing Material: PVC / Silicone / PU(Polyurethane)

Working Voltage: Low voltage(12V/24V/36V/48V), High voltage(120VAC/220VAC)

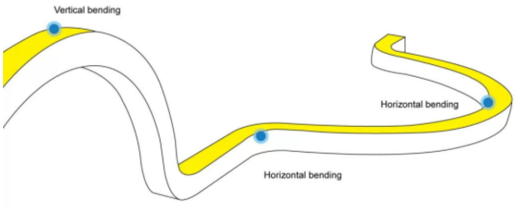
Light Color: Monochrome, Tunable White, RGB, RGBW, DMX512 Pixel RGB, SPI Pixel RGB



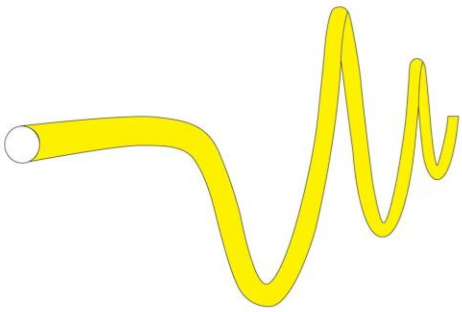
Horizontal Bending(Side Bending)



Vertical Bending(Top Bending)



3D Bending(Horizontal & Vertical Bending)



360 Degree Round

How to produce LED Neon Flex Lights?

The production process is divided into two main parts.

In the first part, the LED flexible strip is produced first, and the LED flexible strip is used as the light source for the neon lights. Please check the blog here if you need to know how to produce led strips in detail.

The second part is to add the silicone shell to the LED strip. There are two main ways to add the silicone shell. The first way is LED strip and silicone integrated extrusion. The second way is to produce the silicone tube first and then put the LED strip into the silicone tube manually.

LED strip and silicone integrated extrusion process

Step 1. Mixing silicone

Silicone is solid, there are generally two kinds of silicone used for neon lights, one is milky white, used to diffuse light, and one is white, used to block light. Neon lights of LEDYi are more advanced, use three colors of silicone, the extra color is transparent, used for cutting windows so that people can see the cutting position more clearly.

The raw material silicone is only one kind. To get different silicone colors, you need to add diffusion powder inside the silicone in a particular proportion. The more diffusion powder you add, the whiter the silicone will be and the lower the light transmission rate.

Step 2. The extrusion process begins with installing rolling LED strips on the payoff frame. These LED strips are adjusted and sequenced using an adjustment table.

Step 3. The LED strip and silicone are then passed through the holes in the pre-assembled die, activating the operating button on the electronic control box, which starts the machine to wrap the silicone onto the LED strip.

Step 4. The machine extrudes the silicone-coated LED strip and passes it through the vulcanizing oven, where the product is gradually vulcanized and shaped. The temperature inside the oven is kept moderate to avoid burning the LED beads. After vulcanization, the led neon is put out by a tractor.

Manual way

Step 1. Using silicone extrusion machines to make silicone neon sleeves or buying silicone neon sleeves from other factories. The silicone neon sleeving production process is similar to the LED strip and silicone integrated extrusion process above. The only difference is that there is no LED strip inside the silicone neon sleeving at the moment. There is only a wire inside.

Step 2. Take the prepared LED strip, tie it to the silicone neon tube with the wire, then pull the wire at the other end of the silicone neon tube to pull the LED strip inside the silicone neon tube.

Silicone integrated extrusion VS Manual way

1. The silicone extrusion method, as the led strip and silicone are extruded as one piece, the led silicone neon can be made longer, theoretically infinitely long. Because of the led strip’ s voltage drop and transportation problems, it is generally recommended not to exceed 50 meters. And the maximum length of the manual way is usually 5 meters. If it exceeds 5 meters, it cannot be pulled in due to the friction between the led strip and the silicone neon tube.

2. The silicone is extruded in one piece, the silicone neon tube will be stuck to the LED strip inside, not loose, and the product quality is better. In contrast to the manual way, the LED strip and the silicone neon tube will move relatively.

3. The efficiency of the integrated silicone extrusion is much higher than the manual method.

4. For small quantities, e.g., 1-meter samples, the one-piece silicone extrusion method can be costly and take longer to produce because of the time and cost involved in setting up the machine. On the other hand, the manual way is effortless as the silicone neon tube is already in stock and only requires the manual pulling of the LED strip into the silicone neon tube.

How to ensure the quality of LED Neon Flex Lights?

1. Ensure that the light source LED strip with the brand or quality assurance LEDs, resistors, and IC components.

2. Ask the factory for the LM80 test report of the LEDs, check the expected life hours of the LEDs in the report, high-quality LEDs, L80 lifetime up to 50,000 hours.

3. Make sure that the PCB used for the light source LED strip is pure copper, double-sided PCB with a thickness of 2oz or 3oz.

4. Ensure that the LED silicone neon light housing is made of RoHS compliant, UV resistant, flame retardant, and corrosion-resistant high-quality silicone.

5. Ensure that the LED silicone neon is certified to the relevant product approvals, e.g., CE, RoHS, UL, etc.

6. Ensure that the color temperature range of the finished silicone neon lamp is as narrow as possible. Our LEDYi’s typically have a color temperature range of plus or minus 100K.

7. Ensure the color rendering index of the silicone neon lamp. The higher the color rendering index, the better! Our LEDYi silicone neon lights have a color rendering index of more than 90.

8. Ensure that the led silicone neon is available with a wide range of accessories. For example, there are solder-free plugs, integrated injection plugs, plugs for different wire outlet directions, mounting clips, mounting aluminum lights.

9. Ensure the LED silicone neon supports customization, OEM, ODM.

Glass Neon Lights vs. LED Neon Lights

Glass neon lights and LED neon lights are two types of lighting. They are commonly used for signage, decor, and artistic purposes. Both types of lights are used to achieve a similar aesthetic effect. Yet, there are significant differences between the two. Here are some critical differences between glass neon lights and LED neon lights:

Brightness and Intensity

Brightness and intensity are closely related but different. Brightness refers to how well-lit a space is. At the same time, intensity refers to how much light is emitted per unit area. Both factors are essential when evaluating lighting quality in neon lights.

The glass neon light’s brightness depends on the tube’s diameter, the gas color used, and the current applied. A typical glass neon light can emit up

to 50 lumens per watt. This makes them less energy-efficient than LED neon lights.

LED neon lights are a newer technology that has become increasingly popular recently. They are bright lights, with a typical LED neon light emitting up to 100 lumens per watt.

Factors	Glass Neon Lights	LED Neon Lights
Brightness	Not as bright	Brighter
Intensity	Up to 50 lumens/watt	Up to 100 lumens/watt
Energy Efficiency	Less efficient	More efficient

Energy Consumption

The energy consumption is an essential factor to consider when choosing between glass neon and LED neon lights. Here’s a comparison between the two:

Glass neon lights consist of tubes filled with neon gas, which is ionized by an electrical current to produce a glowing effect. They require a high-voltage transformer to operate and consume significant energy. In contrast, LED neon lights use LED technology to produce a similar glowing effect but with significantly less energy consumption. Here’s a comparison table to summarize the differences in energy consumption between glass neon and LED neon lights:

Factors	Glass Neon Lights	LED Neon Lights
Voltage	10,000-15,000V	12-24V
Heat Output	High	Low
Energy Usage	Expensive	Cost-effective

Sustainability	Less efficient, High energy	More efficient, energy saving

Durability

Regarding durability, both types of lights have their strengths and weaknesses. Let's compare the two types of lights in terms of durability.

Glass Neon Lights	LED Neon Lights
Glass tubes can be fragile and break if mishandled or exposed to harsh weather conditions.	LED neon lights are made of durable materials like PVC, silicone, or acrylic that can withstand harsh weather conditions and accidental impacts.
Glass tubes are filled with a mixture of gas. They require high voltage to light up, which can result in frequent breakages and flickering.	LED neon lights are powered by low voltage and have a long lifespan of up to 100,000 hours, making them more reliable and long-lasting.

As we can see from the comparison table above, LED neon lights have a clear advantage in terms of durability compared to glass neon lights. LED neon lights are made of durable materials, have a long lifespan, require minimal maintenance, and are energy-efficient. On the other hand, glass neon lights are fragile, require frequent maintenance and replacement, and consume a lot of electricity.

Customizability

Glass neon lights offer customization regarding color and shape. But you can't shape them by yourself as they are made of glass. Instead, they have to be given a structure in the manufacturing factory. And the shape, once formed, is permanent and can't be changed- this limits its customizability.

But with LED neon lights, you can customize the shape by yourself. You can also cut them to your desired length. Besides, these are super flexible, which allows you to bend them to your required angles (based on the type of neon flex). So, you can go for DIY lighting with LED neon lights. Check this

out to make fantastic signage using LED neon lights- How to Make a DIY LED Neon Sign.

Versatility

Glass neon lights offer a unique aesthetic and are well-suited to specific applications. They are less versatile than LED neon lights. Glass neon lights require more maintenance and are more fragile than LED neon lights. This makes them less suitable for outdoor use or areas where they may be subject to damage.

LED neon lights are more versatile than glass neon lights in their durability and functionality. LED neon lights are weather-resistant and can be used indoors and outdoors. This makes them a better choice for outdoor signage and displays. Additionally, LED neon lights are energy-efficient and have a longer lifespan than glass neon lights. Thus it makes them a more sustainable option.

Price

Glass neon lights are typically more expensive than LED neon lights. They are made by skilled artisans who bend and shape glass tubes. The price of glass neon lights can vary depending on the design's size, color, and complexity. On average, a glass neon light can cost anywhere from $150 to $500 per linear foot.

On the other hand, LED neon lights are typically much cheaper than glass neon lights. Because they are mass-produced in factories using automated machines. The price of LED neon lights can vary depending on the design's size, color, and complexity. On average, an LED neon light can cost anywhere from $10 to $30 per linear foot.

Maintenance and Lifespan

Glass neon lights require regular maintenance. This includes cleaning and replacing parts such as transformers and tubes. In addition, glass neon lights are fragile and can break easily, requiring costly repairs. In contrast, LED neon lights require very little maintenance. Also, they are made up of solid-state components that are more durable.

Furthermore, glass neon lights span around 10,000 hours, depending on usage and maintenance. In comparison, LED neon lights have a great lifespan of 50,000-100,000 hours, roughly over seven years. However, LEDYi gives a 3 - 5 years warranty on LED neon flex. And with proper maintenance, they can last longer than a decade.

Safety

The safety comparison between Glass Neon Lights and LED Neon Lights:

- **Heat Emission**

Glass neon lights produce a lot of heat which can cause fire breakout if not installed correctly. LED neon lights, on the other hand, produce minimal heat and are much safer to use.

- **Breakage**

Glass neon lights are fragile and can break easily. Broken glass can cause serious injury and can be a safety hazard. LED neon lights are made of plastic/silicon/PU, making them super flexible. So, they are a safer option with no fear of breakage.

- **Toxicity**

Glass neon lights contain toxic neon gas that can be harmful if inhaled. LED neon lights do not contain any toxic materials and are much safer to use.

Safety Aspect	Glass Neon Lights	LED Neon Lights
Heat Emission	High	Minimal
Electrical Consumption	High	Low
Breakage	Fragile and prone to breakage	Sturdy and less prone to breakage
Toxicity	Contains toxic neon gas	Does not contain any toxic materials

Lifespan	Long lifespan with high maintenance	Longer lifespan

Environmental Comparison

Glass neon lights are not recyclable due to their high content of lead and other hazardous materials. When glass neon lights are broken or disposed of improperly, they can release these harmful substances into the environment. On the other hand, LED neon lights are more environmentally friendly. They are made with non-toxic materials that can be recycled quickly and safely.

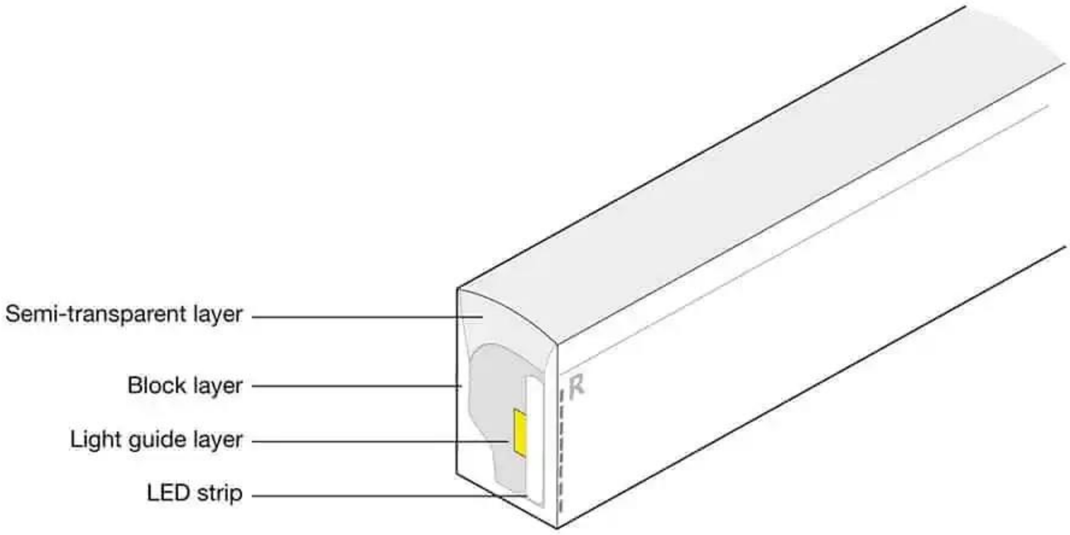
15 Things You Need to Know Before Buying LED Neon Flex

Do you need LED neon flex for decoration or signage? Are you looking for the best LED neon flex to beautify your home or workplace? No worries. I'm here to explain everything with my extensive 10+ years of experience in the led strip and led neon sector.

LED neon flex has been very popular in recent days. They are best for indoor/outdoor or business promotion to outstand your decorative ideas. But you should compare the features with the benefits of LED neon flexes while choosing. So, to make this easier, I've listed 15 things you must consider before buying LED neon flex in this guide. Therefore, go through my experience below and get the best deal for you-

What is LED Neon Flex?

LED neon flexes are silicone or Plastic coated SMD LED light strips that give the illusion of real neon light. These lights are great for indoor and outdoor decoration and making neon signage. Moreover, these are a better option than original neon lights as they are more durable and affordable.



neon flex structure

Things You Need To Know Before Buying LED Neon Flex

You need to know some facts before buying LED Neon flex. I’ve listed those for your convenience-

1. Brightness

The most significant factor when purchasing an LED Neon Flex is brightness. And for LED strips, Lumen is the most used measuring unit. However, Lumen doesn’t indicate the brightness of the light. Instead, it represents the unit of luminous flux that determines the total light output from all directions. So, the higher the value of Lumen, the brighter the light.

The requirement of light brightness varies with the purpose of lighting. That is why you must check the lumen value of the LED Neon flex before choosing one. Yet, if you are looking for the brightest LED neon flex, 360° Round LED Neon Flex is the best option.

2. Color

LED neon lights give an aesthetic look to your decoration with their colorful appearance. But to choose a color for your LED neon lighting, you need to have some basic knowledge about the color property of LED neon lights. These are as follows-

- **Types Of LED Neon Colors**

LED neon flex has different variations based on color. The color of the LED neon flex is indicated with the initials of the color name. For example- RGB stands for Red, Green, and Blue. That means LED neon flex with an RGB mark combines these three colors. Other LED neon flex colors include-

Name Of Color	Meaning
RGB	Combination of Red, Green, and Blue
RGBW	Combination of Red, Green, Blue, and White
DMX512 RGB/RGBW	Digital Multiplex RGB/RGBW (remote control color changing)
Tunable White	Shades of White (Cool to Warm tone)
Monochrome	Single Color

So, know these color types before buying LED neon flex for decorating your space.

- **Correlated Color Temperature (CCT)**

Correlated Color Temperature or CCT indicates different shades of white measured in degree Kelvin (K). For the variation of this unit, the appearance of white changes from a warmer to a cooler tone. For instance, a LED neon flex with 3000k will appear warm white. But with 5000k, it will appear fantastic. For better understanding, I' ve listed below the variations of white lights corresponding to the value of K-

Shades Of White	Degree Kelvin
Ultra Warm (Sleep)	2400K

Warmer (Cozy)	2700K
Warm (Relax)	3000K
Natural (Comfort)	3500K
Natural (Invigorate)	4000K
Cool (Warm)	5000K
Cool (Focus)	6200K

Therefore, by these CCT ratings mentioned above, you can choose the desired tone or shade of white.

- **Color Rendering Index (CRI)**

Color Rendering Index or CRI indicates how well an artificial light source resembles natural light. It is rated from 0-100. With a lower CRI rating, an object looks harsh and dull. That is why CRI is a crucial fact to consider for LEDs. Higher the CRI rating, the better the lighting quality. Check the below table to grade LED neon flex based on CRI-

CRI Ratings	Quality
95 -100	Phenomenon
90 - 95	Great
80 - 90	Good
60 - 75	Poor
Below 60	Very Poor

3. IP Rating (Waterproof)

Ingress Protection Code (IP) indicates protection against water. When installing LED neon flex in waterside areas, i.e., bathrooms, poolside or outdoor locations, it is essential to consider. It indicates protection against water. The higher the value of IP, the more water-resistant the LED is.

The highest water-resistance standard for LED neon flex is IP68. So, if you are looking for a waterproof LED neon flex, purchase IP68 PU Neon Flex or IP68 Silicon Neon Flex.



4. Voltage

LED neon flex is available in two voltage ratings- 12V and 24V. If you require a small installation, 12V is perfect. And for heavy applications, go for 24V. So, before purchasing LED neon flex, decide which voltage rating will be best for your installation.

5. Power Consumption

LED neon flex is popular due to its energy-saving properties. They consume far less electricity than traditional neon lights.

The power consumption of LED neon flex is measured in watts per meter, foot, or reel. So, before buying LED neon flex, check the wattage and choose the correct power-consuming item for your LED project.

6. Dimension

Another significant factor to consider before purchasing LED neon flex is its dimension. Dimension indicates the thickness, height, and width of the flex.LED neon flexes come in a variety of dimensions. However, you can also customize them to your requirements.

7. Length

Before choosing an LED neon flex, the first and most vital step is determining the required length. So, measure the size of the surface where you plan to install LED neon lights. And find out the required length of LED neon flex in meters or feet. Then place your order based on your requirements.

8. Shape

LED neon flexes are available in many shapes. For example- square neon, 3D bend neon, slim neon, flat neon, round 360-degree neon, tri-view neon, and mini neon. Each of these shapes gives a different outlook to your lighting. So, before you purchase LED neon flex, decide which shape is preferable for your installation.

9. Bend Type

LED neon flex is available in various bending profiles. You can set them to bend in your desired direction. However, you must purchase the correct bend type for the LED neon flex to do that. Here are the common bending types of LED neon flex and their uses-



led neon flex bend type

- **Horizontal Bending**

The Horizontal bending LED neon flex means they can bend only at the horizontal axis. These categories of bending LED neon flexes are great for mounting installation. Plus, they are very flexible and give smooth neon effects without creating any shadows.

- **Vertical Bending**

The Vertical bending LED neon flex is bendable only at the vertical axis. These bendings are great for architectural contour, sign lighting, and indoor or outdoor decoration.

- **3D Bending**

3D bending LED neon lights are bendable in vertical and horizontal directions. They are super flexible. So, you can use them for building outlining, landscape lighting, indoor/outdoor areas, etc.

- **360 Degree Round**

360-degree round bending is best for artistic lighting. These flexes are circular and can be installed in any shape. Plus, the lighting of such LED neon flex doesn' t create any dark areas.

10. Dimmer/Controller

You can get a LED neon flex with a dimmable feature. Such a LED neon flex allows you to control the brightness and color of the light. However, the controlling system can be either remote or wall switch. So, go for this feature to adjust the brightness of lights per your requirement.

11. Cutting Unit Length

The cutting unit length is another thing to consider before purchasing LED neon flex. They indicate the minimum length of a flex where you can cut. You can easily get a cutting mark on the casing of LED neon flexes. So, stick to the marks and avoid cutting the flex on any other portion.

12. Quality Verification

You must examine the quality of LED neon flex before buying it. But how to determine its quality? No worries. Consider the below factors to judge the quality of a LED neon flex-

- **Thermal Management**

Overheating decreases the lifespan of LED neon flexes. In simple words, heat is dangerous for LEDs. So, before choosing, ensure the flexes have a proper thermal management system. Going for this feature will keep your LED neon flex last for a long time.

- **Color Accuracy**

The Color accuracy is determined with a CRI rating. So, cross-check the CRI rating with the actual color of the LEDs. For example- 5000k LED neon flex will give a cool white tone. But, if it gets yellowish, you must doubt the quality.

- **Safety Certifications**

Before going for any specific brand of LED neon flex, check the certifications the company has achieved. These certificates testify to the quality of the flex. Before going into any particular brand of LED neon flex, check the credentials the company has earned. These certificates prove the quality of the flex. Some of the essential certificates that a good LED neon manufacturing company must have are-

- Electrical Testing Laboratories (ETL)
- Restriction of Hazardous Substances(RoHS)
- Conformite Europeenne (CE) certifications, etc.

Besides these, there are many other certifications to judge the quality of the LED neon flex. So, get a clear idea about these certifications and choose the best quality possible.

- **Material Quality**

LED neon flex' s performance and durability highly depend on its material quality. So, before purchasing LED neon flex, examine the test reports and the certifications to get a better idea about the material quality.

13. Installation

Before choosing LED neon flex, you must know how to install it. LED neon flexes are constructed of PVC or silicon and are incredibly flexible to handle.

You can easily install and mount them using mounting clips or aluminum mounting channels. First, secure the clips or channels to the wall or wherever they will be installed. Then press the flex on it. That' s all!

14. Warranty

You must consider the warranty of the LED neon flex before choosing it. In case you have any defects with your LED neon flexes, you can use the warranty card to get free services (limited) from the company. For instance, LEDYi offers 3 - 5 years of warranty for their LED products. And if you face any problem within this period, they promise to solve it within seven days.

15. Pricing

The pricing of the LED neon flex varies from brand to brand. The average cost of LED neon flex will be around US$18.66/pc if you get it from any Chinese manufacturer. However, the price depends on the material, color, and many other factors. So, research well and get the best deal for you. But never compromise the quality for the price.

Reasons for Using LED Neon Flex

There are many reasons to choose a LED neon flex for decoration or to use as signage. Here are some reasons listed for you-

Variations in Design & Color

LED neon flex is available in various colors and styles. You can design and shape them however you want. Thus, they allow you to show creativity and stand out in your decorations.

Aesthetic Appearance

LED neon flexes add an aesthetic outlook to your space. These lights take your decoration to the next level in the indoor or outdoor living room or bathroom.

Energy-Efficient

LED neon flexes are highly energy-efficient. Where an original neon light consumes 20 watts/hour, a LED neon light uses only 1.2watt/ hour. So now think how effectively LED neon flexes will save your electricity bills.

Long-Lasting

LED neon flexes can last about three times more than a traditional neon light. So they are much more durable. And you can use them for years without any worries.

Ambient Lighting: The Definitive Guide

Balancing is essential when it comes to interior lighting. And only correct lighting can emphasize the appearance of your decorations. But too many general/ambient lighting options will get you into deep water. No worries; this guide will help you find the best ambient lighting solution for your interiors!

Ambient lighting is the general lighting that brightens up our entire room. Any natural or artificial lighting source can create this type of lighting. You can go for ambient lighting using various light forms like- bulbs, chandeliers, or LED strips. They all work great in their respective fields. But ambient lighting with LED strips brings you more versatile lighting options. And it also takes your interior designs to the next level.

What Is Ambient Lighting?

Ambient lighting works as a substitute for natural lighting. It illuminates your entire space just as any natural lighting does. Thus, any light that enlightens your room falls under ambient lighting. It could be the light of a lamp, a halogen bulb, a chandelier, or the light of the sun/moon.

The Benefits of Ambient Lighting?

Besides illuminating the entire space, ambient lights bring out many benefits. These are as follows-

Produces Natural Effect

Ambient lighting works as a substitute for natural lighting. It illuminates your room, lighting it as natural daylight. Thus, it brings a natural effect to your room.

Creates Cozy Environment

The warm and cool shades of white lights create cozy and comfortable lighting in your room. Usually, lighting with a dimming option is compatible with relaxing lighting effects. You can also get such lighting using floor or table lamps, chandeliers, or LED strips.

Highlights Special Areas

You can highlight specific areas of your room by using ambient lighting. For example, placing track lights over an artwork will focus it while diffusing the light throughout the room.

Reduces Glaring

Ambient lighting is a form of indirect lighting. So, it doesn't create hot spots concentrating on a specific area. Instead, the light beams of ambient lighting spread in all directions. Thus they reduce glaring.

Add Moodiness

The color of light has a significant impact on our mood. For example- warm lights create a calm and relaxing mood. Meanwhile, an excellent color helps create an energetic and exciting mood in your lighting.

Therefore, these are the benefits of ambient lighting. You can use this lighting for your house, office, restaurant, or other commercial areas. It will illuminate your entire space with a natural glow and bring an aesthetic look to your interiors.

How Does Ambient Lighting Look?

Ambient lighting refers to general lighting that illuminates the entire space. So, the outlook of ambient lighting is close to natural lighting.

The source of this type of lighting can be natural or artificial. Like- sun light entering your room through the window or the illumination of a chandelier, both are an example of ambient lighting.

Besides, the lights from small light sources like- table lamps also fall under ambient lighting. That is because it creates an overall lighting impact on the entire room.



Chandeliers

What Lights Can You Use For Ambient Lighting?

There are many options for ambient lighting. Among these, the most effective lights to use for ambient lighting are as follows-

Chandeliers

Chandeliers are excellent at creating subtle ambient lighting. It hangs on the ceiling and comes in different shapes, sizes and designs. So lighting with chandeliers is great for enlightening your dining space, living area, or bedroom. Besides, modern chandeliers’ simplicity makes them suitable for any place.

Track Lights

In-track lighting light fixtures are connected on a track, allowing position adjustment. You can create ambient lighting using them in your living room, dining space, office, etc. Besides, these lights highlight any area/object in your room.

Pendant Lighting

Pendant lighting has a long stand that hangs the light fixtures closer to the table or working station. They provide a soft ambient glow to your space. You can use them on your dining table, kitchen area, or workstation. Apart from these, they are excellent as decorative lighting. The designs of pendant lights give an aesthetic look to your interior decoration.

Pot Lights

Pot lights are also known as recessed lighting. These lights are fitted on the ceiling, emitting light downward, creating ambient lighting. You use them anywhere, combined with LED strips in the bedroom, washroom, conference room, etc.

Table & Floor Lamps

Table lamps have been used from very early ages, but floor lamps have recently become popular. They stand out in creating a soft and aesthetic look to your interior. You can place them in the corner of your living or drawing room. They complement well when placed beside sofas or couches.

Halogen & LED Bulbs

Halogen bulbs or LED bulbs are standard for general lighting. They come in different sizes and work great as ambient lighting. Besides, you can create decorative lighting with halogen bulbs. It can work great to develop vintage interior lighting.

Flexible LED Strips

In creating ambient lighting, flexible LED strips work like magic. They create indirect lighting without glare. Besides, they take your interior lighting to the next level. Again, LED strips are suitable to use both indoors and outdoors. And they also come with color variations and many other advanced options.

So, you can choose any of these discussed lights for creating ambient lighting. But an LED strip is your best choice for advanced lighting options like color changing, brightness adjustment, or tuning with music.



Table & Floor Lamps

How To Create Ambient Lighting With LED Strips

LED strips can work great to create ambient lighting. There are many ways you can produce such lighting. Some of those ways are as follows-

Indirect Lighting

Indirect lighting is the most effective way to bring a natural lighting effect. The light source remains hidden behind a false ceiling or walls in this lighting. And you can quickly get this soft glow using LED strips.

Task Lighting

LED strips work great for creating ambiance effects for task lighting. For instance, installing LED strips under your kitchen cabinet will produce enough illumination for the workstation. You can also use them in the dining area or bathroom.

Dimmers

Dim to warm LED strips produce a candle-like effect that works best for ambiance lighting. It offers you different shades of warm white, creating a cozy atmosphere. Dimming the lights changes the color temperature of the LED strips, and that's how you can make an ambiance effect with dim to warm LED strips.

Accent Light

Accent lighting focuses on a particular area or object. And in doing so, LED strips can help you. You can use them on your bookshelf or showcase. Besides using these strips on your wardrobe, shoe racks uplift your closet's outlook. Accent lighting with LED strips is also great for highlighting products in showrooms or outlets.

Cove Lighting

You can use LED strips around the edges of the walls as cove lighting. Here the illumination directly falls to the ceiling and glows the entire area creating cozy ambient lighting.

Recessed Lighting

You can light the ceiling of your house or office using LED strips as recessed lighting. In doing such lighting, there are chances to get creative. For example- you can make different lighting shapes on the wall using these flexible strips. It will give your indoor decoration a unique look plus assist you in creating a mood.

Mood Lighting

Colors play a vital role in creating a mood. And the color variations available in LED strips work best as mood lighting. RGB and RGBW LED strips offer millions of color shades that will change your room color as per your mood. Besides, you can use these colorful LED strips to decorate your bedroom, vanity, or gaming room.

Combination Of Different Lightings

Combining different types of lighting works best to create ambient lighting. For example- use LED strips around the walls or as cove lighting. Then you can add chandeliers and spotlights. Besides, LED wall washers also work great to vibe it up. This way, you can give your decorations an aesthetic look by mixing a variety of lighting.

Thus, with these ways mentioned above, you can create ambient lighting using LED strips. Moreover, the flexibility and color variations available with LED strips make them the best option for creating warmth and a relaxing mood.



Corridor Ambient Lighting

Required Equipment To Create Ambient Lighting With LED Strips

You can create ambient lighting using a few pieces of equipment. Here are the essentials you will need for this lighting purpose-

- LED Strips

- LED Driver
- Connector
- Scissor or Sharp Blade
- Measuring Tape

Using this simple equipment, you can create ambient lighting with LED strips.

How To Install LED Strips For Ambient Lighting

You can easily install LED strips to create ambient lighting using simple steps. Here, I' ve presented the step-wise procedure to install LED strips-

Step:1: Take Measurements

First, measure the length of the lighting area using a measuring tape. Add one to two inches extra length to your calculation at this stage.

Step:2: Resize The LED Strips

After deciding the required measurement, it' s time to size the LED strips. These flexible strips have cut marks on the printed circuit board. So, using a sharp knife or scissors, you can easily cut them to your desired length. However, you can rejoin them using connectors if you cut them too short.

Step:3: Add Connector to The Strip

Now, take an LED connector and attach it to the LED strip. In this case, make sure you have connected the red wire of the connector to the positive '+' marking of the strip. And the black wire to the negative '- ' marking. Once you have connected the cables correctly, press the clip and lock the connector.

Step:4: Mount The Strip To The Surface

After connecting the connector to the strip-

1. Mount the strip to the desired surface.
2. Pull the adhesive tape on the back of the LED strip and install it to the surface.
3. Press the strip for 8 to 9 seconds to ensure it sticks firmly.

Step:5: LED Drive Connection

Now, take the other end of the connector and connect it to the LED driver. And the next step is to plug the drive into the power supply. That is it; your LED strip installation is complete!

Step:6: Switch On

Turn on the switch and see your strips glowing. But if they don't light, check the connections and try it again.

Thus, following these simple steps, you can easily install LED strips for your bedroom, kitchen, or dining room without professional help.

Things To Consider In Choosing LED Strips For Ambient Lighting

LED strips work best for ambient lighting at your home, office, restaurant, hotel, etc. But before starting your lighting project, you need to have some basic knowledge about LED strips. Here, I've figured out some key facts to consider when purchasing LED strips-

Place To Use

Before installing LED strips, consider where you want to use them. LED strips are suitable for both indoor and outdoor use. For example, if you want to use them to light your bathroom, poolside, or any open space, you must go for a waterproof one.

Again, the choice of color also varies with the place to use. Like- Cozy spaces like bedrooms, living areas, etc., prefer warm lighting. And for this purpose, dim to warm LED strips work best to create ambient lighting.

Besides, you can also go for tunable white LED strips that allow you to adjust warm to cool white lighting. It will assist you in creating a suitable atmosphere as per your mood.

Length

In choosing LED strips for ambient lighting, you should know how long strips your project requires. Usually, the standard LED strips come in 5 meters per reel. So, buy strips keeping this measurement in mind. Yet, for customizable length options, you can go for LEDYi LED strips.

LED Density

LED strips densely arrange LED chips to create a neat lighting effect. Here the density of LEDs affects the lighting visualization. An LED strip with lower LED density makes hotspots that don't wash the lights properly. That is why high-density LED strips such as cob led strips are always preferable. They work best to bring ambient lighting without creating any dots.

Width

A wider LED strip creates more prominent lighting. Usually, the SMD chips within the LED strips are sized, adjusting with the width of the strip. So, when you go for a wider strip, it will give a thicker light effect. But if you want soft and thin lighting effects, go for thinner strips.

Bend Type

Primarily LED strips have a vertical bend type, but the S-Shape LED Strips offer you both vertical bending & horizontal bending options. They are also known as Zig-Zag LED strips, as they allow 90-degree horizontal bends creating a zig-zag structure. In addition, you can curve them and form various shapes for signage and advertisement purposes. So, decide what type of bending your lighting requires and select the ideal category according to it.

Brightness

To know about the brightness of LED strips, you should have a clear idea about the lumen. Lumen indicates the overall brightness of a light source. So, the higher the lumen value, the brighter the light. For example- an SMD5630 LED strip with 50-60lm/LED creates the most brilliant illumination. Yet, you can adjust the brightness by getting a compatible controller with your LED strips to create your desired ambient lighting.

Color

Choosing a color for your LED strips may sound simple, but the matter is more complex. Because you need to keep in mind the lighting area, purpose, and also your personality while selecting light colors. For example- if you put vibrant color LED strips in an office room or a conference area, that will look entirely inappropriate. Again these same color LED strips will work great in decorating bars, pubs, or restaurants. So, be wise in selecting the color for your lighting purpose. Here are some LED strip options for ambient lighting-

- Single Color LED Strip:

Single-color LED strips produce monochromatic lighting. You can create only a single color with these LED strips. And for ambient lighting, you can go for amber, yellow, UV, or any soft color of your preference.

- Tunable White LED Strip:

Tunable white LED strips are best for ambient lighting. These strips allow you to adjust the color temperature of white light to produce warm to cool hues ranging from 1800 K to 6500 K. All you need to do is connect your LED strip to a tunable white LED or a DMX controller. And thus, you can control the lighting effects according to your choice.

- Dim to Warm LED Strip:

Dim to warm LED strips create a natural candle-like effect to your lighting. And for this soft lighting feature, they are great for ambient lighting. These LED strips allow you to adjust the color temperature from 3000K to 1800K. You can get sunrise/sunset effects using these strips as ambient lighting.

- RGBX LED Strip:

RGBX LED strips are a modern approach to ambient lighting. They offer you a wide range of coloring options. With these strips, you can switch from traditional soft ambient lighting to more modern and colorful lighting choices. Yet, there are different types of RGBX LED strips that you can use for ambient lighting.

- Digital Color Changing LED Strip:

Digital color-changing or addressable LED strips take your general lighting to the next dimension. It uses advanced lighting technology that will blow your mind. With these LED strips, you can control each segment of the strip and create a rainbow-like effect. And because of this, it is also known as magic or dream color LED strips.

Soft colors work best for ambient lighting. It could be a warm or cool white; even soft, colorful LED strips will also work great. But if you ask for my suggestion, I recommend going for a tunable white or dim-to-warm LED strip for this purpose. None can beat them for creating a natural and cozy ambient vibe! Yet, you can also choose vibrant, colorful options for a modern lighting approach.



color temperature

Color Temperature

The term Correlated Color Temperature (CCT) is used in measuring the temperature of white color. It indicates the shades of white in correspondence to its temperature. That is why knowing about color temperature is essential to get the right idea about the appearance of a light's color. To get a more precise idea, check the below chart-

Color Temperature (CRI rating)	Lighting Effect
1000K	Candlelight

2000K	Tungsten Light
3000K	Household Light Bulb
4000K	Natural Light
5000K	Daylight
6000K	Cool White
7000K	Overcast
10000K	Skyblue

Thus, color temperatures can bring changes in mood to your lighting. So, in choosing LED strips for ambient lighting, know which color temperature will work best for creating the best vibe in your decoration. And then buy the best one accordingly.

CRI Rating

Color Rendering Index or CRI rating indicates the color accuracy under any lighting. To get better visibility and accurate color, you should go for LED strips with higher CRI. However, the CRI rating is graded from 1-100. Higher the CRI grade, the better color performance it provides. But for the best color accuracy, go for CRI>90.

Voltage

LED strips are available in different voltage ratings. Such as- 5Vdc, 12Vdc, 24Vdc, 36Vdc, and 48Vdc. For heavy lighting, go for a LED strip with a higher voltage. But for a regular house or office lighting, 12Vdc works great. Besides these, customization options allow you to get strips of your desired voltage.

Power Consumption

The light effect of the LED strips highly depends on their power consumption. So, consider the lighting purpose when buying LED strips. Standard strips usually come with power consumption from 2.4w/m to 30w/m. Besides, with LEDYi LED strips, you can get customized power consumption options suitable for accent, ceiling, and cabinet lighting.

IP Rating

Ingress Protection or IP rating indicates the degree of resistance to adverse weather. The higher the IP rating, the more is the LED strip protected from the rugged environment. For example- IP52 indicates protection from dust, and for waterproof LED strips, the IP68 rating is best. So, when creating ambient lighting, decide where you place the LED strips and choose the one with a suitable IP rating.

Controller Type

An intelligent LED controller can change the game when going for ambient lighting with LED strips. You can easily control your lighting with your smartphone or remote. It also offers you DIY color options. Yet, an addressable LED strip with DMX512 light-controlling technology offers you innovative color-adjusting options.

So, before purchasing LED strips for creating ambient lighting, get a clear idea about these features mentioned above. And these will help you to get the best possible deal!

Advantages Of Creating Ambient Lighting With LED Strips

You can get many options for creating ambient lighting, but why go for LED strips? There are thousands of reasons to choose LED strips among all other lighting varieties. Such as-

Durable

The plastic or silicon coating in LED strips makes them flexible and durable. With these strips, no worries about breaking lights during installment.

Besides, they last much longer than traditional lights. For example- LED strips of LEDYi come with a five-year warranty and can work effectively for much longer when any traditional light expires.

Versatile

LED strips offer you various color choices and lighting effects. Besides, it allows you to control the intensity and color of lighting, which makes it even more versatile. Thus you can stand out in creating ambient lighting using LED strips.

Energy-Efficient

LED strips are highly energy efficient in comparison to regular lighting. It uses about 85% less electricity than incandescent lights. So, using LED strips for ambient lighting will create lighting moods and save your electricity bill!

Dimmable

The dimming feature of the LED strip assists you in changing the lighting effects as per your mood. So, you can easily control the light intensity and brightness using a remote or smartphone.

Color Changing Facilities

Tunable White LED strips offer you the most attractive features regarding LED colors. In addition, you can change the color temperature and bring warm to cool colors. This feature can be the only reason to choose LED strips over other ambient lighting options.

Waterproof

If you want ambient lighting for your bathroom or poolside area, LED strips are your best choice. They are available in different IP ratings, which can resist water. You can even light up the inside of your pool using a LED strip with IP68 ratings.

Aesthetic Outlook

Using LED strips indoors and outdoors uplifts the entire outlook of your decoration. For example, the soft and warm lighting with LED strips provides an aesthetic appearance to your house, office, or hotel decoration. Meanwhile, the strips producing vibrant pop-up colors can excite your plane and dull environment. So, whatever mood or outlook you want to create, LED strips will work best!

Thus, LED strips will bring you an excellent ambient lighting experience. Besides, it will stand out your interior decorations and save you money!

How Bright Should Ambient Light Be?

It is essential to have sufficient visibility when choosing the brightness for ambient lighting with LED strips. However, the requirement of light brightness varies with place. Here, I' ve suggested some brightness rating ideal for different areas of your house-

Lightening Area	Recommended Brightness
Bedroom	2000 - 4000 lumen
Living room	1500 - 3000 lumen
Bathroom	3000 - 35000 lumen
Dining Area	470 - 800 lumen

Yet, get a suitable controller for your LED strip that will allow you to adjust the light' s brightness as per your mood. Yet, you can get suggestions from LED experts for suitable illumination for your space. For example, LED Yi offers customizable LED strips, where you can get appropriate brightness for any lighting solution.



ceiling lighting

Where To Use LED Strips For Ambient Lighting

You can use ambient lighting in multiple places to get adequate visibility. Here, I've suggested you some ideas where you can use LED strips for general/ambient lighting-

Ceiling

LED strips are the best option for ceiling lighting. And to do so, you can follow various lighting patterns. For example- outlining the ceiling with LED strips or experimenting with shape and structure will work great for ambient lighting. Besides, creating a false ceiling and installing LED strips like cove lighting will make an excellent indirect lighting effect.

Bedroom

You can use dim to warm LED strips in your bedroom to create a soft, cozy environment. The warm lights of these LED strips help you to sleep better. Besides, going for RGBX LED strips will also give your bedroom a colorful and vibrant look. So, choose the one that goes best with your personality.

Bathroom

For lighting, bathroom LED strips work great. You can use warm or cool white shades in your bathroom's lighting. Besides, using LED strips around the mirror or bathtub will give a unique and uplifted look to your bathroom decorating. Of course, you can also go creative in using this lighting on your bathroom floor. But whatever the design you choose, pick a waterproof LED strip.

Cinema Room

A cinema room requires different lighting to create the right mood. Here, colorful lighting options with RGB LED strips are preferable to tunable white shades. But, again, going for addressable LED strips will change the entire appearance of your cinema room. In addition, these types of strips can change their color, responding to music and backgrounds.

Kitchen Cabinet

Using LED strips to light up your kitchen gives a classic look to your kitchen area. You can use them above and under your cabinet to highlight the textures of your kitchen. Besides, they light up your cooking station for proper visibility.

Vanity Lighting

Lighting around mirrors and drawers gives your vanity an aesthetic look. Here you can use tunable LED strips to create a nice white glow for your vanity. Yet, in the case of choosing LED strips for this purpose, keep the CRI rating in mind.

Gaming Room

RGB or addressable LED strips are great for lighting a gaming room. They create an exciting mood for the entire room with various color combinations that goes well with the gaming theme.

Garage

Lighting with LED strips adds a new dimension to the entire outlook of the garage. For example, you can use them on the ceiling, floor, or to mark the car parking areas, etc.

Staircase

LED strips glow the staircase when you use them as accent lighting. They are ideal for use on the stairs of your house, office, restaurant, hotel, or any commercial area.

Automobile

In creating ambient lighting for cars, LED strips never skip their beat. You can install them inside or outside your vehicle. For example- using a car headlight, beneath the seat, around the windows, under the car, etc.



automobile ambient lighting

Office

In light of your office, you can use LED strips in two ways- task lighting and accent lighting. LED strips on the ceiling of your conference room or workstation will be great for task lighting. Again you can use it on the shelves and cabinets to enhance your office outlook. Besides, flexible wall washers will also look great behind the receptionist’s desk, lighting the company name, etc.

Closet

LED strips are your best lighting solution if you have a walk-in closet. You can use them to highlight your accessories, bag shelves, shoe racks, etc. Besides, placing these strips inside your wardrobe will also work great.

Highlight Artwork

You can use LED strips to highlight any artistic elements in your house. It could be a painting, showpiece, photo frame, or any displaying piece; LED strips can grab your guest’s attention toward it.

Bookshelf

Besides keeping books organized, a bookshelf adds a decorative statement to your space. For example, LED strips in the bookshelf will work excellently as decorative lighting and help you find books quickly.

Aquarium Lighting

Waterproof LED strips will work best in lighting aquariums. There are many colorful options to choose from for this purpose. Yet, you can go for blue LED strips that will add an ocean vibe to your aquarium lighting.

Backyard Lighting

You can use colorful or plain white LED strips to light the backyard of your house. For example, outlining the boundary walls or decorative plants with flexible strips will create aesthetic ambient lighting in your backyard.

Facade Lighting: The Definitive Guide

Lighting plays a crucial role in defining the vibe of a place. It illuminates the area for utility, improves the aesthetics, and creates a mood around it. There are plenty of lighting techniques that have different applications. Some are used to enhance the utility, while others set the tone for the mood of a place. One such type is Facade lighting, which we will discuss in this piece. So, let' s get straight to it.

What is Facade Lighting?

Facade Lighting is used to compliment the exterior of a building. The facade is a term used to refer to the frontal exterior of a building or any structure. It is a technique that highlights the exterior of a property. You get both utility and aesthetic enhancement from it. Facade lighting plays an essential role in defining the feel of a place. As they say, the first impression is the last, and the Facade lighting is the first thing anyone will see in a building. Hence, it has the utmost importance.

A classic example of it is the horror house. The feeling of horror creeps in the moment you step inside that particular area. It is because the Facade lighting of the place sets that mood. If a haunted house displays a happy mood outside, it will not serve its purpose. In contrast, if the property you live in has a facade light like that of a haunted house, it will feel unwelcoming.

The point is while the facade lighting is essential, you must know how to get it right.

Why Is Facade Light Important?

Lighting the exterior of a building is more important than you may imagine. It offers an additional layer of security during the night and keeps trespassers at bay. Furthermore, the facade lights also enhance the utility of the area around the building. For example, if you live in a busy neighborhood, the facade lights on your house will help bypassers navigate.

Similarly, commercial buildings can use facade lights to highlight their logos and advertisement boards. It will make the building stand out even during dark hours. Furthermore, lighting the facade also enhances the aesthetics of a building. As discussed earlier, it creates a vibe around the building, making it memorable for visitors and those who just pass by.

Suitable Facade Lighting

The suitable facade lighting has the following characteristics;

Aesthetic Enhancement

As discussed before, lighting can define the feel of a place. It sparks an emotional response and makes the structure memorable. Our brain recollects memories via emotions, which would not be special unless a place elicits an emotional response. If you decide to light your home’s facade, it will make the guests feel special. Similarly, restaurants, particularly those that offer fine dining, should always uphold its importance. When adequately lighted, the restaurant becomes a special place for visitors. And consequently, drives the business for the restaurants.

Retail stores and other commercial outlets can also use facade lighting to attract customers.

Improves Utility

Facade Lighting not only improves the aesthetics of a place but also enhances its utility. And if it does not perform either of these jobs, it is not suitable. The primary function of facade light is to increase visibility. On residential properties, it makes it easier for bypassers to navigate during the night. And it makes commercial buildings stand out in the market. Fu

rthermore, the facade lighting also keeps trespassers at bay and provides a layer of security.

Sustainability

Sustainability is another feature that is a must for facade lighting. It is imperative because you will keep the lights on all night and cannot ignore the responsibility towards the environment. Furthermore, unsustainable ligh ting can also increase your energy bills, directly impacting you. By select ing an energy-efficient source, you help the environment and reduce your en ergy bills.

And when it comes to sustainability, LEDs offer the best solution. These li ghts can brighten up a space without consuming much energy. You get the sam e illumination level with a 10-watt LED that a 100-watt traditional incande scent bulb offers. Hence, using LEDs for facade lighting will save a decent amount on energy bills. And it would not come with the guilt of negatively impacting the earth.



Facade Lighting

LEDs for Facade Lighting?

LEDs are the intelligent choice for facade lighting, and several reasons exist. Some of them are;

Variety

The market offers a range of LEDs for different purposes. You will not find the same variety in any other light source. Thus, you can personalize the facade however you want—furthermore, these lights can come in all shapes, sizes, and colors. Mixing colors and sizes enhance the aesthetics better than a monotonous design. There is even an option of smart LEDs, which ideally suit commercial businesses.

You will not have to change the lights on different occasions. Just a tap on a smartphone or another remote device will let you select the colors, blinking pattern, and even color temperature.

Durability and Cost-efficient

Facade lighting must be durable because you want to avoid replacing the lights after every few months. It is just too much hassle, and the LEDs prevent that. These lights can last for years, so once you have installed them, you will not require replacements anytime soon. Furthermore, LEDs cost higher upfront but keep it from discouraging you. The amount of capital you will save on the energy bills will make up for it.

More information, you can read [Advantages and Disadvantages of LED Lighting](#).

Types of Facade Lighting

Facade lighting has many types, each of which has a separate application. You must understand the structure and its lighting needs to select the appropriate type. Some common types include;

Uniform Illumination

As the name suggests, uniform Illumination means that the brightness level remains the same throughout the vertical length of a building. You can achi

eve it via floodlights, but it is not a rule. Any light fixture that can cast a uniform beam throughout the length of a property will work. Regardless of the light fixture you pick, you can install them at the top of the building or the bottom of it.

Furthermore, the beam angles of the light must be appropriate. You want them straight down or up because otherwise, it would not produce uniform Illumination.

It would be best if you used uniform Illumination when you want to illuminate the entire structure. Furthermore, you can add different colors to make the lighting more appealing and fun. However, do not add brighter colors to it because that will create a daylight-type environment that does not suit the facade lighting.

Local Lighting

As the name indicates, local lighting illuminates a particular part of a structure. You can use them for light elevations, columns, and even plates. It will highlight the details of these structures. Furthermore, local lighting can also work to enhance the aesthetics of landscapes. For example, if the walls of a property are short and the lawn inside it is visible. You can use the local lighting on plants, paths, and gardens to make them more appealing.

Commercial buildings such as retail stores can use local facade lighting to highlight their logos. You can also use them over the advertisement boards to make them visible at night. And like uniform Illumination, using multiple colors is an option. You can use a combination of colors suitable for a particular place.

Hidden Illumination

Hidden Illumination is the most challenging but also the most appealing type of facade lighting. There are plenty of ways to execute it, including silhouette and contour techniques. With the former method, you must create shapes by installing the lights at strategic angles. You can focus on something other than individual elements with the silhouette technique. In contrast, the contour technique provides a glow and dramatically affects the structure. It would be best if you used LED strips for this technique.

Several other methods, including the ones that can create a backlight effect and generate light shadows, can also work for hidden Illumination. Such lighting looks very elegant from the front. You should pick the technique based on the structure’s shape and lighting needs.

Other facade lighting techniques include direct, washing, accentuating, and grazing lights.

How To Properly Facade Light?

Once you have understood the purpose of facade lighting and know your preferences, you are good to light the exterior of a building. However, there are some rules that you must follow during facade lighting. These are:

1- Complies with Regulations

The facade lighting should always comply with local rules and regulations. You want to avoid legal trouble just for lighting the exterior of a building. Hence, always ensure that the lights are not too bright to cause any inconvenience to the neighbors. Please check with the local law enforcement agency to learn the regulations around it.

Furthermore, even though governments do not bind you to use energy-efficient fixtures, you should use them anyway. Given the energy crisis, the government will likely make it mandatory to use energy-efficient in the coming years. So, you will not have to replace the fixtures in the exterior of your house or commercial building.

2- Should Serve The Purpose

As discussed earlier, facade lighting has several purposes; thus, it should always be in harmony with that. If decoration is the priority, you should pick the colors, brightness, and size of the fixtures accordingly. The techniques to enhance utility and aesthetics are different, and you must understand them before lighting the exterior.

3- Resist Monotony

While lighting the exterior monotonously is more straightforward, it does not achieve the best artistic effect. You should channel your creativity int

o making the building look elegant and attractive. There are different methods to do that. For example, you can pick between floodlights, LED strips, wall washers, and media facades. Furthermore, you can also choose different colors to give the building a bit of your personality.

4- Avoid Light Pollution

You should avoid light pollution even when there are no regulations around it. It is particularly important if the building is located in a busier area. You want car drivers around the building to avoid getting a glare while driving. And it is not just about brightness; the beam angles of the light also play a crucial role. The point is it should be clear whether someone is driving or just walking by.

5- Weather Resistance

Facade lights do not always have a cover of a building which makes them vulnerable to environmental hazards. If the LEDs are not water-resistant, they will become damaged during rain. Furthermore, the UV rays coming directly on them can also cause damage. Hence, you should always look for weather resistance solutions while selecting the facade lights for a building.

More information, you can read IP Rating: The Definitive Guide.

6- Right Colors

Colors will help you set the tone for the mood but remember that some of them are off-limits. For example, you cannot use a combination of blinking red and blue lights. From a distance, it will look like a firetruck or a police vehicle. Similarly, if the house is at a beach, avoid the colors the coast guard and sailors use to communicate.

7- Never Install Facade Light Yourself

Only install the facade lights yourself if you are a certified electrician. The risk of electrical failure is much higher with exterior lights; thus, you cannot afford any errors. Call a professional to understand the number of LEDs or other light sources you will need and ensure safety from electric

al fires. Allow them to inspect the area and adequately install the lights that meet the community’ s guidelines.



Facade Lighting

Factors To Consider While Facade Lighting?

Now that you know most things about facade lighting, there are a few things that you must look for before executing it on a building or any other struc ture. These include;

Not All Parts Need To be Highlighted

A rookie mistake, while facade lighting is the Illumination of the entire f rontal area. Sometimes it is required, but most times, lighting just the im portant spaces suffice. Hence, before lighting up the whole facade, take a comprehensive look at it and understand whether it is even needed.

You should identify the significant viewpoints of the structure and light o nly them. But the views might vary depending on the viewers. For example, t he perspective for the same property will be different for a pedestrian tha

n for someone sitting in a high-rise building nearby. You have to select the viewers and light the facade accordingly.

The Mood You Want To Set

As discussed earlier, facade lighting has a defining role in determining the mood of a place. The selection of a mood will dictate everything else. For example, a residential property should have a calm and composed mood. In contrast, a plaza or a retail shop can have an extravagant lighting style. The restaurants, on the other hand, can be more flexible depending on the customer experience they offer. Furthermore, always look at whether the facade has a unique rhythm, pattern, balance, or symmetry that you can highlight with the light.

Utility

The utility is an essential function of facade lighting but varies in different structures. For example, a bank or commercial property might need brighter lights for security, but a residential property can work without the additional Illumination. Hence, you must consider the functionality of the space before designing a plan for facade lighting.

Type of Light

While facade lighting a property, you will have two choices, direct or indirect light. Direct light is more like natural light and provides higher brightness. While it illuminates the area better, it also produces glares. If you stare at the lights long enough, it can lead to exhaustion and headaches. Hence, you should avoid it in areas where you sit for an extended period during the night. But anti-glare options are also available if you want to maintain aesthetics.

The indirect light produces diffused brightness which does not cause strain on the eyes. It reflects on the fitting surface and creates a relaxed atmosphere. But the downside to indirect light is it makes the space look dull.

The best solution is to blend direct and indirect light to create a balanced environment.

Color Temperature

Color temperature is a scale used to define the color of light on a spectrum. You can pick between warm to cold temperatures depending on the needs of a space. For example, the cold temperature works best for parks and around open workstations. In contrast, warm temperatures are ideal for residential buildings. The lights with Kelvin temperatures of over 5000K are cold, whereas those that fall in the 2700-3000K range are warmer.

Landscape Lighting: The Definitive Guide

Landscape Lighting can transform the outdoor space from a seemingly-dull area to something that deserves to be in movie scenes. But it is essential to do it right because wrong lighting can have the opposite effect. You cannot just pick any outdoor space area and light it without considering the types of lights and different techniques, among other things.

But you have nothing to worry about because, as always, we have got you covered. This guide entails everything you need to know to turn your backyard and front lawn into a place of beauty. So, let’s get straight to it.

Why is Landscape Lighting Important?

The landscape is essential because it enhances the aesthetics of your place. Everyone wants to make one’s home look as good as possible, and landscape lighting is the ideal and the easiest way to do so. Excellent lighting can turn an ordinary lawn or backyard into something truly incredible.

Furthermore, the landscape’s lighting also influences its inhabitants’ moods. Dull lighting will project a dull mode that can wrap you in the waves of gloom. In contrast, a well-lit-up landscape projects liveliness and cheers your mood.

Landscape lighting can also make the place memorable for visitors. Humans memorize the area with the feelings it projects. Thus, if a home offers a lively mood, visitors will remember it as a happy place, and vice versa.

Landscape lighting also has a practical application, which is security. It keeps the intruders away and makes it easy to recognize them quickly.

Which Landscape Sites To Light?

Now that you have understood the importance of landscape lighting, let’s look at the elements in the landscape that you can light. You have to remember three things while lighting a landscape: Aesthetics, Safety, and Entertainment. Good landscape lighting should possess all three characteristics.

The temptation to light the entire landscape is understandable, but you should not give in. Always remember that strategic lighting is better and more effective than installing many lights at random locations. Let’s look at the places you can light to make landscape lighting effective.

- **Walking Paths**

Lighting walking paths is vital because it improves the safety of the area. It makes it easier to navigate and watch out for obstacles along the way. Such lighting should illuminate the entire walking track.

- **Patio Lights**

People who use their outdoor space a lot should install patio lights. It will improve the aesthetics of a place and enhance its utility. You can host parties in such an environment and even use it to relax late at night.

- **Deck Lights**

Illuminating the decks is crucial for navigating around and outside the house. Such lights will also improve the utility inside the house.

- **Hardscape Lights**

If your house has a landscape with walls, wooden arbors, and rocks, lighting them will make it look incredibly cool.

- **Garden Lights**

Lighting the garden creates an attractive environment at night. It will make the walks during the night more enjoyable. Such lights will compel you to spend more time with nature.

- **Pond Lighting**

You can use the pond as a central point or anchor for the lighting. Highlighting the ponds creates appealing aesthetics and draws attention to them. You can creatively light features around the ponds to add a bit of a dramatic vibe to the landscape.



Deck Lights

Types of Landscape Lighting?

Understanding the types of landscape lighting is just as important as understanding which parts to light. You can use traditional incandescent bulbs, halogen lights, and LEDs to illuminate the landscape. But LEDs are the ideal choice primarily because of their energy efficiency, durability, and general flexibility. However, within the LEDs, there is a lot of variety; each has a defined application. You must understand the purpose and function of each light to find the correct one for the landscape.

1. Spotlights and Floodlights

Spotlights and Floodlights are the most intense light fixtures, but both have different applications. The fundamental difference between the two is the beam angle. Spotlights project a concentrated angle which is typically around 45 degrees. You can use them to highlight specific areas or display points. For example, spotlights will be perfect if you want to highlight an architectural detail, spotlights will be ideal.

On the other hand, floodlights have wider beams that spread at an angle of 120 degrees. Such lights offer more generalized illumination that you can use to enhance the utility of an area. When it comes to landscape lighting, you should create the ambiance with floodlights and then detail the different elements with other types of lights.

2. Inground Lighting

Inground lights are the fixtures meant to be installed on the grounds. You can use these lights to illuminate walking tracks and driveways. Typically, these lights are subtle and improve the sophistication and visibility of the area. You can also install them under the trees in your garden to light their complete structure. While the in-grounds lights work fine on their own, it is best to blend them with floodlights.

3. Outdoor Post Lights

Outdoor Post Lights work like accent lights and highlight the path leading to your place. The brightness of such lights is not overpowering and essentially sets an ambient tone for the visitors. You can use tall post lights to illuminate larger areas like driveways and shorter posts for small alcoves. To ensure post lights are not overpowering in brightness, you must find the correct number of lights needed for the space you want to illuminate.

The general rule is to note the diameter a light takes around a post and install the next fixture outside that diameter. You can also be creative and install fixtures on alternative sides to make the driveways look even more appealing.

4. Path Lights

Path lights have similar applications to post lights but are more subtle. You can use them to highlight the path inside your property. Such fixtures add more appeal to the landscape than the inground fixtures, which also have similar applications. However, the price of such fixtures is also higher, and the installation is a bit tricky. The height of such fixtures is significant; you should keep them about 14 inches tall to get an even glow for the path.



Path Lights

Different Designs of Landscape Lighting?

The next step in illuminating the landscape is understanding different strategies you can use to make it appealing. You can use various designs for various purposes. The combination of other techniques delivers the best results. Let's look at the strategies or designs you can use while lighting a landscape.

- Highlighting

As the name suggests, highlighting means illuminating an objective’s features, such as color, shape, or form, to make it more interesting. You can achieve it by using either spotlights or floodlights at the bottom of that object. Adjusting the beam angle and the distance from the thing will deliver the desired effect. You can use this technique under the statute, plants, or other unique elements in your landscape.

- Accent Lights

Accent lights also highlight the features of different objects but in a subtle manner. You can use a narrow beam of spotlights projected from the object’s top or bottom. Furthermore, such lights work best for elements in the second tier of importance. For example, the highlight will work best for a big tree at the garden’s center. But for the other trees around it, you should go with accent lights. Be mindful to hide the light if you want to go with accent lights.

- Shadowing

The shadowing technique creates a shadow of an object on the wall or any other hardscape. This technique can add a dramatic effect to the landscape. The spotlights and well lights work the best for this technique. You should identify a vantage point and direct the spotlight to the object you want to shadow.

- Downlighting

Downlighting is a technique that illuminates the garden or the landscape by mimicking the natural light. You can use different lights and project them from the tall structure to illuminate the entire area. Such lights work better to enhance the utility of a place rather than improving the aesthetics.

- Grazing

Grazing creates dramatic shadows, which work best if the landscape has a textured surface. You can achieve this effect by using lights and creating shadows of different objects in a hardscape.

- Uplighting

Uplighting is opposite to downlighting and projects the light on an object from the bottom. Instead of providing a generalized illumination, such lights enhance a specific area. And also, these lights work better to enhance the aesthetics than improve the area's utility.

- Washing

You can achieve washing by lighting a large wall and projecting an indirect beam angle. Floodlights are ideal for washing because they project an even light. Furthermore, such lights are best for the areas designed for entertainment.

- Moonlighting

If you want to create a moonlight effect in the trees, you can use spotlights high in trees that project beams downwards. It is essential to use a soft light that bathes the ground gently and creates shadow from the tree's branches.



Garden Light

LED Strips for Landscape Lighting?

While there are various types of lights that you can use to illuminate the landscape, LED strips make an ideal option. And there are good reasons for it which include the following:

Cost-effective

Compared to traditional bulbs, LED strips take less energy and save a lot in energy bills. Looking for a cost-effective solution is essential because you will need many lights to illuminate the landscape effectively. If you go with traditional bulbs, it will overburden the pocket with energy bills.

LEDs use about 75% less energy than incandescent bulbs, which means you will reduce energy consumption by 75%. Given the surge in energy prices, you will save a huge chunk of your monthly budget by opting for LEDs.

Furthermore, the LEDs might cost higher upfront, but it should not discourage buyers. The amount of energy they save makes up for it.

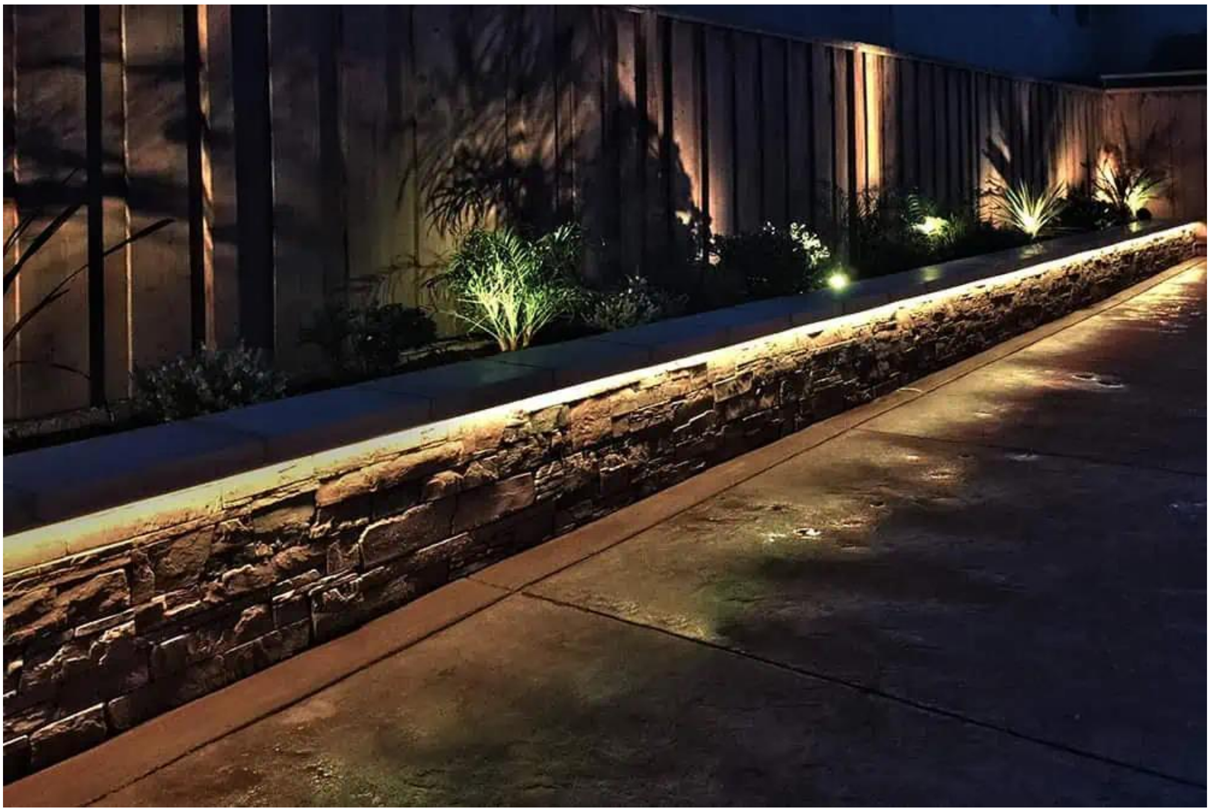
Durability

As evident from this guide, illuminating a landscape is a tedious process. And once you have completed it, you will not want to replace the lights every couple of months. The solution? You have guessed it right … the LEDs. In general, LEDs last about 25 times longer than traditional bulbs. It essentially means if a bulb lasts one month, the LEDs will last more than two years.

Generally, LED lights can last up to 50,000 hours of lights, and some brands offer LEDs that can last more than 100,000 hours. The point is once you have installed LEDs, you will not need replacement anytime soon.

Flexibility

As discussed earlier, lighting a landscape all comes down to your creativity. And traditional bulbs can act as a limiting factor owing to their lack of variety. On the other hand, LEDs offer a wide variety in terms of shapes, colors, and sizes. You can run wild with your creativity, and there will be a LED that will fit the purpose.



LED Strip Light

General Tips To Light The Landscapes

You should know pretty much all the important factors in lighting a landscape. But to make things even easier, let us give you some tips;

- You do not have to hire an electrician to light the landscape because most landscape lights are low voltages. All you need is a wire stripper, and you are ready to light the landscape on your own.

- If your landscapes have halogen fixtures, there is no need to get new ones. You can fit the LEDs in old halogen fixtures and still reap the benefits of LEDs. However, be mindful that LEDs should have the same base and wattage to work in these fixtures.

- You will want to run the wires in the landscape underground while illuminating a landscape. Hence, marking the paths of wire is essential to avoid accidental shoveling while planting a new tree.

- Do not use factory-installed connectors because they are prone to corrosion and failure when buried underground. Instead, use gel-filled w

ires with splice connections that are tailor-designed for the outdoors.

- You do not have to use powerful lights on the patio. It is an area designed to relax, and overpowering lights do not fit the purpose. Instead, illuminate the boulders, trees, and other elements around the patio and get indirect light from them.

- Please do not use too many lights because it will negate the purpose. You have to install the lights strategically so that no two fixtures overlap.

- Use multicolor lights in some spaces to bring a more dramatic and fun vibe to the landscape. You can get smart LEDs that offer remote controls. Just a tap on a smartphone can change its color, blinking pattern, and even brightness. Such lights will work the best, especially if you organize many parties in outdoor spaces.